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For related information see also *Astronautics*.

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18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 1429

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Includes management planning and research.

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Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1569
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 1570
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1571
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1571
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 1572
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1573
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 1573

Note: N.A. means that no abstracts were assigned to this category for this issue.

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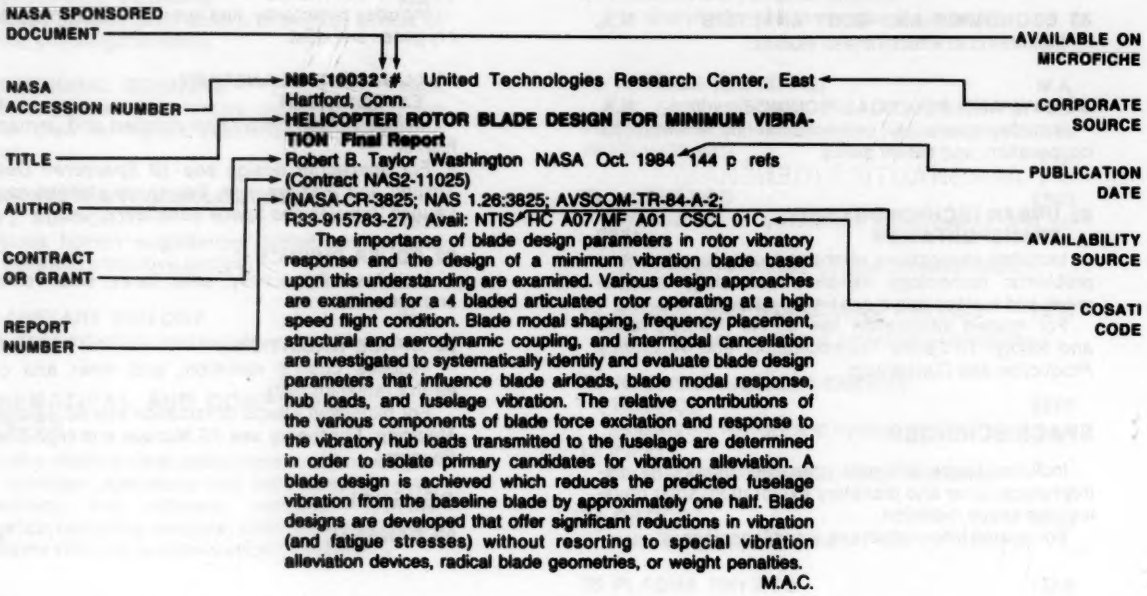
TYPICAL CITATION AND ABSTRACT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N85-10032*# United Technologies Research Center, East Hartford, Conn.
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
(Contract NAS2-11025)
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 10 / MAY 23, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-18949* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Feb. 1985 131 p
(NASA-SP-7037(184); NAS 1.21:7037(184)) Avail: NTIS HC $6.00 CSCL 01A

This bibliography lists 425 reports, articles and other documents introduced into the NASA scientific and technical information system in January 1985. A.R.H.

N85-18950*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETAILED PRESSURE DISTRIBUTION MEASUREMENTS OBTAINED ON SEVERAL CONFIGURATIONS OF AN ASPECT-RATIO-7 VARIABLE TWIST WING
G. Thomas Holbrook and Dana Morris Dunham Mar. 1985 66 p refs
(NASA-TM-86308; L-15859; NAS 1.15:86308) Avail: NTIS HC A04/MF A01 CSCL 01B

Detailed pressure distribution measurements were made for 11 twist configurations of a unique, multisegmented wing model having an aspect ratio of 7 and a taper ratio of 1. These configurations encompassed span loads ranging from that of an untwisted wing to simple flapped wings both with and without upper-surface spoilers attached. For each of the wing twist configurations, electronic scanning pressure transducers were used to obtain 580 surface pressure measurements over the wing in about 0.1 sec. Integrated pressure distribution measurements compared favorably with force-balance measurements of lift on the model when the model centerbody lift was included. Complete plots and tabulations of the pressure distribution data for each wing twist configuration are provided. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-18951*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STATIC INTERNAL PERFORMANCE OF A TWO-DIMENSIONAL CONVERGENT NOZZLE WITH THRUST-VECTORING CAPABILITY UP TO 60 DEG
Laurence D. Leavitt Feb. 1985 70 p refs
(NASA-TP-2391; L-15837; NAS 1.60:2391) Avail: NTIS HC A04/MF A01 CSCL 01A

An investigation was conducted at wind-off conditions in the static-test facility of the Langley 16-Foot Transonic Tunnel to determine the internal performance characteristics of a two-dimensional convergent nozzle with a thrust-vectoring capability up to 60 deg. Vectoring was accomplished by a downward rotation of a hinged upper convergent flap and a corresponding rotation of a center-pivoted lower convergent flap. The effects of geometric thrust-vector angle and upper-rotating-flap geometry on internal nozzle performance characteristics were investigated. Nozzle pressure ration was varied from 1.0 (jet off) to approximately 5.0. Author

N85-18952*# National Aeronautics and Space Administration, Washington, D. C.
ON THE FLOW PROCESSES IN SHARPLY INCLINED AND STALLED AIRFOILS IN PARALLEL MOVEMENT AND ROTATION
M. Kohler Sep. 1984 44 p refs Transl. into ENGLISH from Luftfahrtforsch. (West Germany), v. 16, no. 4, 1939 p 158-177 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77509; NAS 1.15:77509) Avail: NTIS HC A03/MF A01 CSCL 01A

The purpose of this study is to obtain a deeper insight into the complicated flow processes on airfoils in the region of the buoyancy maxima. To this end calculated and experimental investigations are carried out on a straight stationary, a twisted stationary and a straight rotating rectangular wing. According to the available results the method gives results which can be applied sufficiently for flow applied firmly on all sides for all rotation values. The reliability of the method may be questioned for a flow undergoing transition from the attached to the separated state or for totally separated flow and higher rotation values. Author

N85-18953*# National Aeronautics and Space Administration, Washington, D. C.
PROFILE DESIGN FOR WINGS AND PROPELLERS
A. Quast and K. H. Horstmann Dec. 1984 33 p refs Transl. into ENGLISH of "Profilauslegung fuer Tragfluegel und Propeller" Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1983 p 107-138 Presented at the Probl. and Develop. Trends in Gen. Aviation Symp., Friedrichshafen, West Germany, 24-25 Mar. 1983 Original language document was announced in IAA as A84-15411 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-4005)
(NASA-TM-77785; NAS 1.15:77785) Avail: NTIS HC A03/MF A01 CSCL 01A

It has now become customary to develop profiles for wings and propellers for a given employment of the aircraft. This is possible because methods and computers are available to study an entire series of variants in comparatively short time. The basic viewpoints for profile design are presented. It is shown that laminarization has its advantages in almost all cases, including the design of a turbine blade and the design of the profile of an airliner. The requirements which profiles have to satisfy are

discussed along with the possibilities for increasing lift on profiles. G.R. (IAA)

N85-18954*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOME FIGHTER AIRCRAFT TRENDS
Leroy Spearman Jan. 1985 38 p refs Presented at AIAA Aircraft Design, Systems, and Operations Meeting, San Diego, Calif., 31 Oct. - 2 Nov., 1984
(NASA-TM-86352; NAS 1.15:86352) Avail: NTIS HC A03/MF A01 CSCL 01A

Some basic trends in fighters are traced from the post World II era. Beginning with the first operational jet fighter, the P-80, the characteristics of subsequent fighter aircraft are examined for performance, mission capability, effectiveness, and cost. Characteristics presented include: power loading, wing loading, maximum speed, rate of climb, turn rate, weight and weight distribution, cost and cost distribution. The characteristics of some USSR aircraft are included for comparison. The trends indicate some of the rationale for certain fighter designs and some likely characteristics to be sought in future fighter aircraft designs. E.A.K.

N85-18955# National Aerospace Lab., Tokyo (Japan).
ANALYSIS OF INVISCID TRANSONIC FLOW AROUND AN AIRFOIL BY DIAGONAL FORM OF IAF SCHEME
Nobuhiro Kawai Aug. 1984 15 p refs In JAPANESE; ENGLISH summary
(NAL-TR-831; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

In order to analyze inviscid transonic flow around an airfoil, the program has been developed for solving two-dimensional Euler equations by the diagonal form of implicit approximate factorization scheme. Numerical results show two patterns of shock. The other, a flow from supersonic to supersonic, exhibits oblique shock. Numerical solutions of Euler equations are compared with those of potential flow, showing the differences in shock position, and pressure rise after shock. Author

N85-18956*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE SHUTTLE ORBITER TRIMMED CENTER-OF-GRAVITY EXTENSION STUDY. VOLUME 9: EFFECTS OF CONFIGURATION MODIFICATIONS ON THE AERODYNAMIC CHARACTERISTICS OF THE 140 A/B ORBITER AT MACH NUMBERS OF 1.5, 2.0, AND 2.5
W. Pelham Phillips and Roger H. Fournier Jan. 1985 98 p refs 9 Vol.
(NASA-TM-72661-Vol-9; NAS 1.15:72661-Vol-9) Avail: NTIS HC A05/MF A01 CSCL 01A

Wind-tunnel tests were conducted at Mach 1.5 to 2.5 to determine the effect of modifications designed to extend the forward center-of-gravity trim capability on the static longitudal and lateral directional characteristics of a Space shuttle 140 A/B orbiter model (0.01 scale). The modifications consisted of a forward-extended wing fillet, a flat plate canard, and a blended canard. The investigation was conducted in the low Mach number test section of the Langley unitary plan wind tunnel at a Reynolds number of approximately 2.15 million based on the fuselage reference length. The test angle of attack range was -1 deg to 32 deg and the sideslip angles were 0 deg and 5 deg. Author

N85-18957*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF AIRFOIL SHAPE, THICKNESS, CAMBER, AND ANGLE OF ATTACK ON CALCULATED TRANSONIC UNSTEADY AIRLOADS
John T. Batina Mar. 1985 56 p refs
(NASA-TM-86320; L-15786; NAS 1.15:86320) Avail: NTIS HC A04/MF A01 CSCL 01A

The effects of airfoil shape, thickness, camber, and mean angle of attack on transonic unsteady airloads were investigated as calculated by the transonic small-disturbance computer code XTRAN2L. Shape effects were investigated by examining the pressure distributions, shock locations, and unsteady airloads for three 10 percent thick airfoils. NACA 0010, NACA 64A010, and parabolic arc. Thickness effects were determined by studying a single airfoil shape with three different thicknesses: NACA 0008, NACA 0010, and NACA 0012. Angle of attack and camber effects were studied by including mean angle of attack or by adding a simple parabolic camber distribution to the originally symmetric airfoils. Comparisons of unsteady airloads for different airfoil configurations show similar results caused by variations in airfoil shape, thickness, camber, or mean angle of attack. Computer costs can be reduced by limiting the number of transonic unsteady aerodynamic calculations for small changes in airfoil geometry or angle of attack. Author

N85-18958*# Analytical Methods, Inc., Redmond, Wash.
INVISCID ANALYSIS OF UNSTEADY BLADE TIP FLOW CORRELATION STUDIES Final Report
B. M. Rao and B. Maskew Feb. 1985 67 p refs
(Contract NAS1-15472)
(NASA-CR-172506; NAS 1.26:172506; AMI-8409) Avail: NTIS HC A04/MF A01 CSCL 01A

Two computer programs, VSAERO-TS and VSAERO-H, were used for computing the unsteady subsonic aerodynamic characteristics of arbitrarily shaped wings oscillating in pitch. Program VSAERO-TS is a time-stepping analysis capable of treating large amplitude motions while program VSAERO-H uses harmonic wake and small amplitude assumptions. A comparison between the computed (VSAERO-TS and VSAERO-H) and DFVLR test results for chordwise pressure distributions for rectangular, swept, taper and ogee blade tips is presented in this report. A wide range of angles of attack (mean) from 0 to 12 deg and reduced frequencies of 0.1, 0.2 and 0.3 are covered in this report. Also, the comparison includes several spanwise stations. B.W.

N85-18959*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFICIENT SELF-CONSISTENT VISCOUS-INVISCID SOLUTIONS FOR UNSTEADY TRANSONIC FLOW
James T. Howlett Jan. 1985 12 p refs Presented at the 23rd AIAA Aerospace Sci. Meeting, Reno, Nev., 14-17 Jan. 1985
(NASA-TM-86335; NAS 1.15:86335) Avail: NTIS HC A02/MF A01 CSCL 01A

An improved method is presented for coupling a boundary layer code with an unsteady inviscid transonic computer code in a quasi-steady fashion. At each fixed time step, the boundary layer and inviscid equations are successively solved until the process converges. An explicit coupling of the equations is described which greatly accelerates the convergence process. Computer times for converged viscous-inviscid solutions are about 1.8 times the comparable inviscid values. Comparison of the results obtained with experimental data on three airfoils are presented. These comparisons demonstrate that the explicitly coupled viscous-inviscid solutions can provide efficient predictions of pressure distributions and lift for unsteady two-dimensional transonic flow. Author

N85-18960*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
UNSTEADY TRANSONIC FLOW CALCULATIONS FOR TWO-DIMENSIONAL CANARD-WING CONFIGURATIONS WITH AEROELASTIC APPLICATIONS
John T. Batina Feb. 1985 11 p refs Proposed for presentation at the AIAA/ASME/ASCE/AHS 26th Struct., Struct. Dyn. and Mater. Conf., Orlando, Fla., 15-17 Apr. 1985
(NASA-TM-86375; NAS 1.15:86375; AIAA-85-0585) Avail: NTIS HC A02/MF A01 CSCL 01A

Unsteady transonic flow calculations for aerodynamically interfering airfoil configurations are performed as a first step toward solving the three dimensional canard wing interaction problem. These calculations are performed by extending the XTRAN2L two dimensional unsteady transonic small disturbance code to include an additional airfoil. Unsteady transonic forces due to plunge and pitch motions of a two dimensional canard and wing are presented. Results for a variety of canard wing separation distances reveal

the effects of aerodynamic interference on unsteady transonic airloads. Aeroelastic analyses employing these unsteady airloads demonstrate the effects of aerodynamic interference on aeroelastic stability and flutter. For the configurations studied, increases in wing flutter speed result with the inclusion of the aerodynamically interfering canard. Author

N85-18961*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VISCOUS EFFECTS ON TRANSONIC AIRFOIL STABILITY AND RESPONSE
H. M. Berry, J. T. Batina, and T. Y. Yang Feb. 1985 15 p refs Proposed for presentation at the AIAA/ASME/ASCE/AHS 26th Struct., Struct. Dyn. and Mater. Conf., Orlando, Fla., 15-17 Apr. 1985
(NASA-TM-86374; NAS 1.15:86374; AIAA-85-0586) Avail: NTIS HC A02/MF A01 CSCL 01A

Viscous effects on transonic airfoil stability and response are investigated using an integral boundary layer model coupled to the inviscid XTRAN2L transonic small disturbance code. Unsteady transonic airloads required for stability analyses are computed using a pulse transfer function analysis including viscous effects. The pulse analysis provides unsteady aerodynamic forces for a wide range of reduced frequency in a single flow field computation. Nonlinear time marching aeroelastic solutions are presented which show the effects of viscosity on airfoil response behavior and flutter. Effects of amplitude on time marching responses are demonstrated. A state space aeroelastic model employing Pade approximants to describe the unsteady airloads is used to study the effects of viscosity on transonic airfoil stability. State space dynamic pressure root loci are in good overall agreement with time marching damping and frequency estimates. Parallel sets of results with and without viscous effects reveal the effects of viscosity on transonic unsteady airloads and aeroelastic characteristics of airfoils. Author

N85-18962*# George Washington Univ., Washington, D.C.
DETERMINATION OF CORRECTIONS TO FLOW DIRECTION MEASUREMENTS OBTAINED WITH A WING-TIP MOUNTED SENSOR M.S. Thesis
Thomas Martin Moul Aug. 1983 91 p refs Sponsored in part by NASA
(NASA-CR-174412; NAS 1.26:174412) Avail: NTIS HC A05/MF A01 CSCL 01A

The nature of corrections for flow direction measurements obtained with a wing-tip mounted sensor was investigated. Corrections for the angle of attack and sideslip, measured by sensors mounted in front of each wing tip of a general aviation airplane, were determined. These flow corrections were obtained from both wind-tunnel and flight tests over a large angle-of-attack range. Both the angle-of-attack and angle-of-sideslip flow corrections were found to be substantial. The corrections were a function of the angle of attack and angle of sideslip. The effects of wing configuration changes, small changes in Reynolds number, and spinning rotation on the angle-of-attack flow correction were found to be small. The angle-of-attack flow correction determined from the static wind-tunnel tests agreed reasonably well with the correction determined from flight tests. Author

N85-18963# Ballistic Research Labs., Aberdeen Proving Ground, Md.
HYPOTHETICAL ZERO YAW DRAG TRAJECTORY OF SPINNING PROJECTILES BETWEEN M = 5 AND M = 10 Final Report
W. F. Donovan Nov. 1984 32 p
(DA Proj. 1L1-62618-AH-80)
(AD-A148899; AD-F300525; BRL-MR-3404) Avail: NTIS HC A03/MF A01 CSCL 19/1

From a review of existing techniques and extrapolation of lower velocity data, the drag characteristics of a typical spin stabilized projectile are proposed for application in the range $5<M<10$. GRA

N85-18964# Tennessee Univ. Space Inst., Tullahoma. Gasdynamics Div.
AERODYNAMIC IMPROVEMENTS BY DISCRETE WING TIP JETS Final Report, Sep. 1981 - Nov. 1983
J. M. Wu and A. D. Vakili Wright-Patterson AFB, Ohio AFWAL Mar. 1984 102 p
(Contract F33615-81-K-3034)
(AD-A148981; AFWAL-TR-84-3009) Avail: NTIS HC A06/MF A01 CSCL 20/4

The effects of applying discrete wing tip jets on a rectangular wing and the generated flow field have been studied. Analysis included low speed wing tunnel testing, water tunnel testing and analytical modeling. Wing tip jet parameters investigated included number of jets, jet direction, shape of jets, and blowing coefficients. Tailoring of jet parameters to optimize planform circulation and flow separation were included. Flow interactions of the discrete tip jets with wing vorticies were successfully visualized with water tunnel techniques. Author (GRA)

N85-18965# National Aerospace Lab., Amsterdam (Netherlands).
UNSTEADY TRANSONIC PRESSURE MEASUREMENTS ON A SEMISPAN WIND-TUNNEL MODEL OF A TRANSPORT-TYPE SUPERCRITICAL WING (LANN MODEL). PART 2: PRESSURE DISTRIBUTIONS (PLOTTED) AND PLOTS OF THE VIBRATION MODES Final Technical Report, Apr. 1980 - Apr. 1982
J. J. Horsten, R. G. denBoer, and R. J. Zwaan Wright-Patterson AFB, Ohio AFWAL Mar. 1983 189 p
(Grant AF-AFOSR-0136-80)
(AD-A130488; AFWAL-TR-83-3039-Pt-2; NRL-TR-82069-U-Pt-2) Avail: NTIS HC A09/MF A01 CSCL 20/4

Unsteady transonic pressure measurements were performed on a semi-span wind-tunnel model of a transport-type supercritical wing oscillating in pitch. For each run, the vibration mode and detailed steady and unsteady pressure distribution were measured. Sectional as well as wing aerodynamic coefficients were obtained by integration of the pressure distribution. The tests covered a Mach number range between 0.62 and 09.5. The reduced frequency covered a range between zero and a maximum value varying from 0.3 at m = 0.62 to 0.2 at m = 0.95 (related to half mean aerodynamic chord). B.W.

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-18966# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
EVALUATION OF THE BIRDSTRIKE THREAT TO THE F-15 PRESENT FLEET, RAPID DEPLOYMENT FORCE, AND DUAL ROLE FIGHTER TRANSPARENCIES
P. Kolodziejczyk Sep. 1984 57 p
(AD-A148954; ASD-TR-84-5026) Avail: NTIS HC A04/MF A01 CSCL 01/3

The information contained in this report is developed from analytical and empirical techniques used to establish statistical models for evaluating the birdstrike threat to the F-15 aircraft transparencies. Consideration is given to two areas: (1) the operational impact rate for specific aircraft usage profiles, and (2) the probability of a random birdstrike which could result in penetration of the aircraft cockpit. GRA

N85-18967# Federal Aviation Administration, Washington, D.C. Office of Civil Aviation Security.
SEMIANNUAL REPORT TO CONGRESS ON THE EFFECTIVENESS OF THE CIVIL AVIATION SECURITY PROGRAM Recurring Report, 1 Jan. - 30 Jun. 1984
11 Oct. 1984 19 p
(AD-A149522; DOT/FAA/ACS-84-1(20)) Avail: NTIS

HC A02/MF A01 CSCL 01/2

This report provides details on the effectiveness of security screening of passengers and all property intended to be carried out in the aircraft cabin in the air transportation or intrastate air transportation. It also provides a statistical summary of aircraft hijackings and alleged violations of Federal Aviation regulations pertaining to security screening. GRA

N85-18968# Department of the Navy, Washington, D. C.
DEPLOYMENT SEQUENCE MODE SELECTION SYSTEM FOR AIRCRAFT EJECTION SEAT Patent Application
P. Ayoub and A. Cantor, inventors (to Navy) Filed 8 Sep. 1983 19 p
(AD-D011464; US-Patent-Appl-SN-531097) Avail: NTIS HC A02/MF A01 CSCL 01/3

An electronic system is described for selecting the proper mode sequence for deploying a recovery parachute from an aircraft ejection seat. The system senses altitude, airspeed, and sink rate; and compares these to predetermined reference signals. The system also incorporates logic circuits and time delay circuits. The logic circuits are arranged to select one of four time delays depending on the status of the various parameters relative to the reference signals. GRA

N85-19658# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PERSONNEL PROTECTION CONCEPTS FOR ADVANCE ESCAPE SYSTEM DESIGN
James W. Brinkley *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 12 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-18969# Defence Research Establishment, Ottawa. (Ontario).
AN ALIGNMENT FIXTURE FOR A 2-DEGREE-OF-FREEDOM (TDF) GYROSCOPE
R. G. Apps Jun. 1984 19 p
(AD-A148885; AD-E850737; DREO-TN-84-5) Avail: NTIS HC A02/MF A01 CSCL 17/7

A description of the Honeywell GG1111 Single-Degree-Of Freedom (SDF) strapdown gyroscope alignment fixture and it's shortcomings are presented. The requirements for a new all aluminum alignment fixture for the Litton CSG-2 Two-Degree-Of-Freedom (TDF) strapdown gyroscope are discussed. A description of the new alignment fixture package is presented. GRA

N85-18970# Department of the Air Force, Washington, D.C.
TRANSDIGITIZER FOR RELAYING SIGNALS FROM GLOBAL POSITIONING SYSTEM (GPS) SATELLITES Patent Application
E. E. Westerfield, inventor (to Air Force) Filed 31 Oct. 1984 25 p
(AD-D011442; US-Patent-Appl-SN-666784) Avail: NTIS HC A02/MF A01 CSCL 17/7

The reception, downconversion and retransmission of the 1575.42 MH2 Global Positioning System (GPS) satellite signal is accomplished by the following. First, an RF stage comprising of an antenna, filter and preamplifier receiver, filters and amplifies the 1575.42 MHz signals. Following the RF stage, a converter stage, consisting of a bandpass filter, converts the GPS signal to a lower frequency. Then, an Intermediate Frequency (IF), comprising an IF amplifier, multiplier, bandpass filter and limiter further amplifies and filters the signals to remove the effects of the signals. A final downconverter converts the signal to a base band frequency and in a zero crossing detector the signal to a base band frequency and in a zero crossing detector the signal is amplified and 1 bit quantized. Finally, a local oscillator controls a frequency synthesizer to latch the signal from the zero crossing detector in a flip flop, which in turn is used to control a quadraphase monitor, whose signals are amplified and transmitted out the transmit antenna.
Author (GRA)

N85-18971# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
THE USE OF SYNTHETIC APERTURE RADAR IMAGERY TO DETECT HAZARDS TO NAVIGATION
E. S. Kasischke, G. A. Meadows, and P. L. Jackson Nov. 1984 253 p Original contains color illustrations
(Contract N00014-83-C-2223)
(AD-A149324; ERIM-169200-2-F) Avail: NTIS HC A12/MF A01 CSCL 17/9

The purpose of this manual is to familiarize the hydrographer with the methods and techniques to interpret synthetic aperture radar (SAR) imagery for hazards to navigation. Numerous examples of SAR imagery are presented to familiarize the hydrographer with how a SAR detects bottom-related surface patterns and also surface patterns caused by other oceanic and meteorologic phenomena, such as winds, storms, rain, internal waves, gravity waves, deep and shallow water currents, water mass boundaries and ice. The principles of imaging radars, specifically SARs, are discussed. SAR systems, whose imagery are available to the hydrographer, are described and the sources of the imagery identified. The fundamental concepts on how a SAR detects ocean surface patterns, particularly bottom-related patterns, are presented, along with the hydrodynamic causes of these patterns. Test cases are discussed which illustrate the different types of surface patterns on SAR imagery which are bottom-related. Multi-temporal analysis of SAR imagery is described. Sources of false alarms are identified. Techniques to combine SAR data with other remotely-sensed imagery (a multi-sensor analysis) are discussed. Methods to digitally process SAR data, including geometric and radiometric rectification, are presented. GRA

N85-18972# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical and Computer Engineering.
OPTICAL DATA PROCESSING FOR MISSILE GUIDANCE Final Report, Sep. 1983 - Sep. 1984
D. Casasent 21 Nov. 1984 136 p
(Grant AF-AFOSR-0091-79)
(AD-A149346; AFOSR-84-1162TR) Avail: NTIS HC A07/MF A01 CSCL 17/7

Research on optical data processing for missile guidance and robotics is described. Components addressed include acousto-optic cells. Pattern recognition work includes feature extraction (Fourier coefficients and moments) and correlation (using synthetic discriminant functions). All pattern recognition work concerns multi-class distortion-invariant pattern recognition. Optical linear algebra processors are addressed with attention to: algorithms, architectures, applications, Kalman filtering, system fabrication, accuracy and performance, plus error source modeling and simulation. GRA

N85-18973# Federal Aviation Administration, Washington, D.C.
NATIONAL AIRSPACE SYSTEM: OPERATIONAL REQUIREMENTS
Oct. 1984 210 p
(AD-A149349; AD-E751073) Avail: NTIS HC A10/MF A01 CSCL 17/7

The National Airspace System (NAS) Plan for Facilities, Equipment and Associated Development has set a framework for the modernization of the NAS for the next decade. It was developed with specific overall goals in a mind. These include the replacement and modernization of an aging air traffic control and navigation system, the development of a total system related to the specific

needs of the user community, and the design of that system to serve as a basis for further enhancement of safety, improved efficiency, and reduced operation costs. The primary objective of this document is to provide a comprehensive and accurate representation of the requirements of the entire aviation community, while accommodating modifications or new requirements in response to changing operational needs during the NAS evolution. It is not a stand alone document, but one that is supported by a myriad of other documents and specifications. GRA

N85-18974# Coast Guard Research and Development Center, Groton, Conn.
AN EVALUATION OF FLASHTUBE SIGNAL CHARACTERISTICS Final Report
J. R. Thacker Aug. 1984 32 p
(AD-A149569; CGR/DC-13/84; USCG-D-26-84) Avail: NTIS HC A03/MF A01 CSCL 17/7

The United States Coast Guard has long been interested in using flashtubes as an aid-to-navigation. They are highly conspicuous and are energy efficient. In the single flick operation mode, mariners report difficulty in fixing the time (less than 10 milliseconds). This factorial experiment investigated the effect on observer performance as each of three factors was varied; (1) Flash Repetition Rate; (2) Flick Frequency; and (3) Number of Flicks comprising the multiflick flash. An analysis of variance revealed all three main factors to be significant as well as some interactions. From the model provided, observer performance can be predicted by specifying the three factors. A simplifying parameter is introduced which reduces the performance model to two factors. Recommendations are made for each of these factors.
Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-18975*# National Aeronautics and Space Administration, Washington, D. C.
THE DESIGN OF SPORT AND TOURING AIRCRAFT
R. Eppler and W. Guenther Dec. 1984 29 p refs Transl. into ENGLISH of "Die Auslegung von Sport- und Reiseflugzeugen" rept. DGLR-83-01 Deutsche Gesellschaft fuer Luft- und Raumfahrt, Bonn, 1983 p 13-39 Presented at the Probl. and Develop. Trends in Gen. Aviation Symp., Friedrichshafen, West Germany, 24-25 Mar. 1983 Original language document was announced in IAA as A84-15407 Transl. by The Corporate Word, Inc., Pittsburgh, Pa.
(Contract NASw-4006)
(NASA-TM-77783; NAS 1.15:77783; DGLR-83-01) Avail: NTIS HC A03/MF A01 CSCL 01C

General considerations concerning the design of a new aircraft are discussed, taking into account the objective to develop an aircraft can satisfy economically a certain spectrum of tasks. Requirements related to the design of sport and touring aircraft included in the past mainly a high cruising speed and short take-off and landing runs. Additional requirements for new aircraft are now low fuel consumption and optimal efficiency. A computer program for the computation of flight performance makes it possible to vary automatically a number of parameters, such as flight altitude, wing area, and wing span. The appropriate design characteristics are to a large extent determined by the selection of the flight altitude. Three different wing profiles are compared. Potential improvements with respect to the performance of the aircraft and its efficiency are related to the use of fiber composites, the employment of better propeller profiles, more efficient engines, and the utilization of suitable instrumentation for optimal flight conduction. G.R. (IAA)

N85-18976# National Aerospace Lab., Tokyo (Japan).
LOW-SPEED WIND TUNNEL TESTS OF THE NAL FAN-JET STOL RESEARCH AIRCRAFT MODEL WITH GROUND SIMULATION BY TANGENTIAL BLOWING
Aug. 1984 109 p refs In JAPANESE; ENGLISH summary
(NAL-TR-828; ISSN-0389-4010) Avail: NTIS HC A06/MF A01

To investigate the basic aerodynamic characteristics of the turbofan powered lift STOL aircraft near the ground, wind tunnel tests were made on the 8% NAL Quiet STOL Research Aircraft complete with an upper surface blowing flap system in the NAL 6.5 m x 5.5 m low speed wind tunnel. The wind tunnel tests were conducted using a fixed ground plane with tangential blowing boundary layer control instead of a moving belt ground plane. The tests covered the effects on longitudinal and lateral static stability produced by variations of flap angle and engine thrust, and by ground proximity. Some of the more significant effects of ground proximity include appreciable changes in six component force and moment once jet impingement occurred. These data obtained in the wind tunnel tests were offered for analysis of flying qualities of the NAL Quiet STOL Research Aircraft. Author

N85-18977*# Kentron International, Inc., Hampton, Va. Aerospace Technologies Div.
PRELIMINARY PERFORMANCE OF A VERTICAL-ATTITUDE TAKEOFF AND LANDING, SUPERSONIC CRUISE AIRCRAFT CONCEPT HAVING THRUST VECTORING INTEGRATED INTO THE FLIGHT CONTROL SYSTEM
A. W. Robins, F. L. Beissner, Jr., C. S. Domack, and E. E. Swanson Feb. 1985 40 p refs
(NASA-CR-172530; NAS 1.26:172530) Avail: NTIS HC A03/MF A01 CSCL 01C

A performance study was made of a vertical attitude takeoff and landing (VATOL), supersonic cruise aircraft concept having thrust vectoring integrated into the flight control system. Those characteristics considered were aerodynamics, weight, balance, and performance. Preliminary results indicate that high levels of supersonic aerodynamic performance can be achieved. Further, with the assumption of an advanced (1985 technology readiness) low bypass ratio turbofan engine and advanced structures, excellent mission performance capability is indicated. G.L.C.

N85-18978*# Textron Bell Helicopter, Fort Worth, Tex.
INTEGRATED TECHNOLOGY ROTOR/FLIGHT RESEARCH ROTOR (ITR/FRR) CONCEPT DEFINITION
James H. Harse Moffett Field, Calif. Army Research and Technology Labs. Mar. 1983 85 p Sponsored in part by NASA Ames Research Center
(Contract DAAK51-81-C-0026)
(NASA-CR-166443; NAS 1.26:166443;
USAAVRADCOM-TR-84-A-4) Avail: NTIS HC A05/MF A01 CSCL 01C

A program was performed to identify and evaluate a variety of candidate rotor hub configurations for the ITR/FRR. Design criteria were established for the development of the hub concepts. Eight initial hub configurations were examined and two were selected for further refinement and evaluation. The selected concepts were bearingless designs with and without lead-lag dampers. The selected concepts were refined to the point that their physical properties relative to the Government's technical goals and manufacturing aspects could be assessed. In addition, variations that could be incorporated for the FRR were identified and compatibility for installation on the RSRA was addressed. Author

N85-18979*# Kaman Aerospace Corp., Bloomfield, Conn.
INTEGRATED TECHNOLOGY ROTOR/FLIGHT RESEARCH ROTOR (ITR/FRR) CONCEPT DEFINITION Contractor Report, Aug. 1981 - Mar. 1982
H. E. Howes and C. A. Tomashofski Moffett Field, Calif. Army Research and Technology Labs. Mar. 1983 140 p refs Sponsored in part by NASA Ames Research Center
(Contract DAAK51-81-C-0029)
(NASA-CR-166445; NAS 1.26:166445;
USAAVRADCOM-TR-83-A-5) Avail: NTIS HC A07/MF A01 CSCL

01C

A program was performed to identify and evaluate a variety of candidate rotor hub configurations for the ITR/FRR. Design criteria were established for the development of the hub concepts. Five initial hub configurations were examined and two were selected for further refinement and evaluation. The selected configurations were bearingless designs. The Classic Elastic Pitch Beam (CEPB) and the Plain Elastic Pitch Beam (PEPB), both exhibit superior qualities for the criteria in the final evalution. The CEPB is favored over the PEPB primarily because it offers better capability for built in damping for stability and is judged to have a lower risk in development. Author

N85-18980*# Sikorsky Aircraft, Stratford, Conn.
INTEGRATED TECHNOLOGY ROTOR/FLIGHT RESEARCH ROTOR CONCEPT DEFINITION STUDY Contractor Report, Sep. 1981 - Feb. 1982
Raymond G. Carlson, Edward A. Beno, and Harold D. Ulisnik Moffett Field, Calif. Army Research and Technology Labs. Mar. 1983 92 p refs Sponsored in part by NASA
(Contract DAAK51-81-C-0030)
(NASA-CR-166446; NAS 1.26:166446; USAAVRADCOM-TR-83-A-6; SER-510084) Avail: NTIS HC A05/MF A01 CSCL 01C

As part of the Integrated Technology Rotor/Flight Research Rotor (ITR/FRR) Program a number of advanced rotor system designs were conceived and investigated. From these, several were chosen that best meet the started ITR goals with emphasis on stability, reduced weight and hub drag, simplicity, low head moment stiffness, and adequate strength and fatigue life. It was concluded that obtaining low hub moment stiffness was difficult when only the blade flexibility of bearingless rotor blades is considered, unacceptably low fatigue life being the primary problem. Achieving a moderate hub moment stiffness somewhat higher than state of the art articulated rotors in production today is possible within the fatigue life constraint. Alternatively, low stiffness is possible when additional rotor elements, besides the blades themselves, provide part of the rotor flexibility. Two primary designs evolved as best meeting the general ITR requirements that presently exist. An I shaped flexbeam with an external torque tube can satisfy the general goals but would have either higher stiffness or reduced fatigue life. The elastic gimbal rotor can achieve a better combination of low stiffness and high fatigue life but would be a somewhat heavier design and possibly exhibit a higher risk of aeromechanical instability. M.G.

N85-18981*# Hughes Helicopters, Culver City, Calif.
INTEGRATED TECHNOLOGY ROTOR/FLIGHT RESEARCH ROTOR (ITR/FRR) CONCEPT DEFINITION STUDY Contractor Report, Sep. - Mar. 1982
Charles W. Hughes Moffett Field, Calif. Army Research and Technology Labs. Mar. 1983 146 p refs Sponsored in part by NASA
(Contract DAAK51-81-C-0028)
(NASA-CR-166444; NAS 1.26:166444; USAAVRADCOM-TR-83-A-2; HHI-82-144) Avail: NTIS HC A07/MF A01 CSCL 01C

Studies were conducted by Hughes Helicopters, Inc. (HHI) for the Applied Technology Laboratory and Aeromechanics Laboratory, U.S. Army Research and Technology Laboratories (AVRADCOM) and the Ames Research Center, National Aeronautics and Space Administration (NASA). Results of predesign studies of advanced main rotor hubs, including bearingless designs, are presented in this report. In addition, the Government's rotor design goals and specifications were reviewed and evaluated. Hub concepts were designed and qualitatively evaluated in order to select the two most promising concepts for further development. Various flexure designs, control systems, and pitchcase designs were investigated during the initial phases of this study. The two designs selected for additional development were designated the V-strap and flat-strap cruciform hubs. These hubs were designed for a four bladed rotor and were sized for 18,400 pounds gross weight with the same diameter (62 feet) and solidity (23 inch chord) as the existing rotor on the Rotor Systems Research Aircraft (RSRA). B.W.

N85-18982# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
8 Nov. 1984 49 p Transl. into ENGLISH from various Chinese articles
(JPRS-CST-84-037) Avail: NTIS HC A03/MF A01

National developments in China relating to research institutes, the life sciences, and applied sciences are discussed. For individual titles, see N85-18983 through N85-18983.

N85-18983# Joint Publications Research Service, Arlington, Va.
DETAILS OF EXPORT A-5 CLOSE-SUPPORT AIRCRAFT GIVEN
In its China Rept.: Sci. and Technol. (JPRS-CST-84-037) 8 Nov. 1985 p 31-34 Transl. into ENGLISH from Hangkong Zhishi (Beijing), no. 9, Sep. 1984 p 12-13 (For primary document see N85-18982 10-05)
Avail: NTIS HC A03/MF A01

The technical specifications of the A-5, China's supersonic attack aircraft, are enumerated. The following parameters are among those considered: maximum takeoff weight, takeoff speed, range, engine afterburning power, fuel capacity and consumption, and weapons capability. R.S.F.

N85-18984# Army Military Personnel Center, Alexandria, Va.
A METHODOLOGY FOR THE DETERMINATION OF ROTARY WING AIRCRAFT VULNERABILITIES IN AIR-TO-AIR COMBAT SIMULATION Final Report
K. L. Travis 23 Nov. 1984 87 p
(AD-A148984; AD-E301513) Avail: NTIS HC A05/MF A01 CSCL 01/3

This research effort proposes a methodology to calculate an aircraft's vulnerability in an air-to-air engagement. The primal processes of such an engagement--detection, acquisition, missile launch, missile intercept and probability of kill--are modeled using an electro-optical device as the source of target detection. The resultant probability of kill is depicted as a function range or a given aspect angle. This constitutes an enhancement over the traditional kill/no kill representation in that the entire distribution may be obtained for the selected engagement angle. Since little historical or actual test data is available for comparison, evaluation requirements for such a conceptual methodology is discussed. A recalibration process is recommended which will allow the refinement of the model as tests are conducted and observed data becomes available. Applications of the methodology results are recommended for the areas of research and development and pilot tactical training. A pilot decision logic based upon the results of executing the methodology is proposed. GRA

N85-18985# Aeronautical Research Labs., Melbourne (Australia). Structures Div.
LONG TERM DURABILITY OF UREA FORMALDEHYDE GLUED JOINTS REMOVED FROM VAMPIRE AIRCRAFT
T. VanBlaricum and C. A. Patching Jun. 1984 27 p
(AD-A149053; ARL-STRUC-TM-381) Avail: NTIS HC A03/MF A01 CSCL 13/5

Two Vampire fuselages originally manufactured in 1950 were used for the Australian Aeronautical Research Lab.'s Vampire Wing Fatigue Tests carried out between 1960 and 1965. The Vampire fuselage is of laminated wooden monocoque construction using spruce, improved wood and aircraft plywood, bonded with Urea Formaldehyde glue. After completion of the wing fatigue tests a number of wooden specimens were removed from these fuselages and stored under ambient laboratory conditions until Sept. 1983. At the time of specimen removal, the fuselages had been subjected to a total of 67,238 and 42,279 hours actual flying and simulated life. Careful inspection of the fuselages before removal of the specimens revealed on indication of any defect indicating that design strength requirements were not being met. This report describes the condition of the wooden joints from these specimens, broken open in Sept., 1983. At this time the glue bonds had

reached a life of 33 years. This report concludes that long term exposure (18 years) of these wooden specimens to an ambient laboratory environment had not led to any significant deterioration of the Urea Formaldehyde bonded joints, and that after 33 years since manufacture the joints were still satisfactory. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-18986# Boeing Military Airplane Development, Seattle, Wash.
PICTORIAL FORMAT DISPLAY EVALUATION Final Technical Report, Sep. 1981 - Sep. 1983
T. C. Way, M. E. Hornsby, J. D. Gilmour, R. E. Edwards, and R. E. Hobbs Wright-Patterson AFB, Ohio AFWAL May 1984 183 p Original contains color illustrations
(Contract F33615-81-C-3610)
(AD-A149252; AFWAL-TR-84-3036) Avail: NTIS HC A09/MF A01 CSCL 01/4

Two sequential simulation studies were conducted to evaluate the usability and acceptability of pictorial format displays for fighter aircraft; to determine whether usability and acceptability were affected by display mode--color or monochrome; and to recommend format changes based on the simulations. Government-furnished formats were modified for dynamic display on CRTs in a simulator cockpit to support a representative mission scenario with surface and air threats. Objective performance data, subjective pilot ratings and comments were collected, and the formats were revised on the basis of this data. In the Basic Pictorial Display Evaluation study, pictorial formats were implemented and evaluated for flight, tactical situation, system status, engine, stores management and emergency status displays. In the Threat Warning Study, the number of threats, and the amount and type of threat information were increased. A total of thirty USAF and Navy pilots in the two studies flew mission simulations with color and monochrome versions of the displays. In general, the pilots found the pictorial format displays, and the specific implementation used in these studies quite acceptable, and preferred the color over the monochrome versions. GRA

N85-18987# Department of the Navy, Washington, D. C.
AIRSPEED SENSING PRESSURE VALVE SYSTEM Patent Application
P. Ayoub, inventor (to Navy) Filed 29 Jun. 1984 19 p
(AD-D011472; US-Patent-Appl-SN-627307) Avail: NTIS HC A02/MF A01 CSCL 13/11

The present invention relates generally to a system for deploying a parachute during ejection of an occupant from a disabled aircraft, and more particularly to a fail-safe means of sensing airspeed in such a system. It is a general purpose and object of the present invention to provide a simple, yet effective airspeed sensor, used in a system for deploying a parachute during ejection of an occupant from a disabled aircraft, which stores peak dynamic pressure in order to selectively delay parachute deployment as a function of airspeed and altitude at ejection. GRA

N85-18988# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TECHNICAL EVALUATION REPORT ON THE 46TH SYMPOSIUM OF THE AVIONICS PANEL ON SPACE SYSTEM APPLICATIONS TO TACTICAL OPERATIONS
Joseph Statsinger (Aerospace Corp., El Segundo, Calif.) Loughton, England Sep. 1984 16 p Symp. held in Hampton, Va., 17-20 Oct. 1983
(AGARD-AR-203; ISBN-92-835-1478-5) Avail: NTIS HC A02/MF A01

The highlights are presented of the NATO Secret AGARD Avionics Panel Symposium on space system applications to tactical operations, which convened in order to accomplish the following: (1) provide an overview of tactical needs which are effectively addressed by space systems; (2) characterize the various existing and potential space systems with emphasis on those attributes which are most related to tactical needs; (3) assess the advantages and limitations of space systems in supporting combat operations; (4) investigate the interaction of space assets with ground and mobile resources and the consequent operational issues; and (5) discuss future trends in space technology and their relationship to evolving combat needs. R.S.F.

N85-19664# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
ELECTRONIC DISPLAYS: THEIR STRENGTHS AND WEAKNESSES FOR ADVANCED HIGH PERFORMANCE AIRCRAFT
Harry L. Snyder and R. H. Bogle *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 11 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-18989# Department of the Air Force, Washington, D.C.
ONE-PIECE HPTR BLADE SQUEALER TIP Patent Application
R. L. Horvath, inventor (to Air Force) Filed 1 Jun. 1984 12 p
(AD-D011452; US-Patent-Appl-SN-616380) Avail: NTIS HC A02/MF A01 CSCL 21/5

An improved high pressure turbine rotor blade and tip cap structure is provided which comprises a tip end closure for the blade bonded to the end wall of the blade casting and including a base plate member and a pair of upstanding side walls defining a peripheral contour coincidental with and faired to the cambered side walls of the casting, the base plate member having a plurality of radially outwardly opening passageways therethrough and disposed along the chord of the blade and communicating with a channel included in the radially outwardly facing surface of the casting along a chord of the blade, the passageways disposed along axes at angles to the base plate whereby coolant fluid flowing therethrough is directed against the tip side wall surfaces; an opening is provided through the end wall of the casting in the form of a slit or a plurality of holes along the chord of the blade and intersecting the channel, to define an outlet through the end wall for passage of coolant fluid through the blade. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-18990*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A METHOD FOR ESTIMATING THE ROLLING MOMENT DUE TO SPIN RATE FOR ARBITRARY PLANFORM WINGS
William A. Poppen, Jr. Jan. 1985 23 p refs
(NASA-TM-86365; NAS 1.15:86365) Avail: NTIS HC A02/MF A01 CSCL 01C

The application of aerodynamic theory for estimating the force and moments acting upon spinning airplanes is of interest. For example, strip theory has been used to generate estimates of the

aerodynamic characteristics as a function of spin rate for wing-dominated configurations for angles of attack up to 90 degrees. This work, which had been limited to constant chord wings, is extended here to wings comprised of tapered segments. Comparison of the analytical predictions with rotary balance wind tunnel results shows that large discrepancies remain, particularly for those angles-of-attack greater than 40 degrees. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-18991*# National Aeronautics and Space Administration, Washington, D. C.

AERONAUTICAL FACILITIES CATALOGUE. VOLUME 1: WIND TUNNELS

Frank E. Penaranda, comp. and M. Shannon Freda, comp. Jan. 1985 421 p 2 Vol.

(NASA-RP-1132; NAS 1.61:1132) Avail: NTIS HC A18/MF A01 CSCL 14B

Domestic and foreign wind tunnel facilities are enumerated and their technical parameters are described. Data pertinent to managers and engineers are presented. Facilities judged comparable in testing capability are noted and grouped together. Several comprehensive cross-indexes and charts are included. R.S.F.

N85-18992# National Aerospace Lab., Tokyo (Japan).

WALL INTERFERENCE ESTIMATION OF THE NAL'S TWO-DIMENSIONAL WIND TUNNEL

Hideo Sawada, Seizou Sakakibara, Mamoru Satou, and Hiroshi Kanda Aug. 1984 25 p refs In JAPANESE; ENGLISH summary

(NAL-TR-829; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Experiments with airfoil models at high subsonic speeds were carried out in the NAL's Two Dimensional Wind Tunnel. The models were NACA0012 and GK-75-06-12 in airfoil. There were two NACA0012 models with chord lengths of 250mm. The upper and lower walls of the test section of the tunnel are slotted. The open area ratio of the slotted walls was set at 3 and 10% in the tests. In the tests of the smaller NACA0012 model, the total pressure of the uniform flow was set at 1,667 times that for the larger NACA0012 model. Thus the test Reynolds number was set at the same value for tests of the two different size models. The data obtained were corrected by the wall interference correction method developed at NAL. Pressure measured along the upper and lower walls is used in this method. The correction method works very well in the range tested. In addition, the wall interference characteristics of the NAL's Two Dimensional Wind Tunnel were examined at the same time. B.W.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-18993*# Wyle Labs., Inc., Huntsville, Ala.

COMMERCE LAB: MISSION ANALYSIS AND PAYLOAD INTEGRATION STUDY Interim Progress Report

6 Dec. 1984 87 p

(Contract NAS8-36109)

(NASA-CR-174381; NAS 1.26:174381) Avail: NTIS HC A05/MF A01 CSCL 22A

Conceived as one or more arrays of carriers which would fly aboard space shuttle, Commerce Lab can provide a point of focus for implementing a series of shuttle flights, co-sponsored by NASA and U.S. domestic concerns, for performing materials processing in research and pre-commercial investigations. As an orbiting facility for testing, developing, and implementing hardware and procedures, Commerce Lab can enhance space station development and hasten space platform production capability. Tasks considered include: (1) synthesis of user requirements and identification of common element and voids; (2) definition of performance and infrastructure requirement and alternative approaches; and (3) carrier, mission model, and infrastructure development. A.R.H.

N85-18994*# Stanford Univ., Calif. Lab. of Physics.

A PRELIMINARY STUDY OF A CRYOGENIC EQUIVALENCE PRINCIPLE EXPERIMENT ON SHUTTLE Final Report

C. W. F. Everitt and Paul W. Worden, Jr. 8 Jan. 1985 38 p refs

(Contract NAS8-33796)

(NASA-CR-171300; NAS 1.26:171300) Avail: NTIS HC A03/MF A01 CSCL 22A

The Weak Equivalence Principle is the hypothesis that all test bodies fall with the same acceleration in the same gravitational field. The current limit on violations of the Weak Equivalence Principle, measured by the ratio of the difference in acceleration of two test masses to their average acceleration, is about 3 parts in one-hundred billion. It is anticipated that this can be improved in a shuttle experiment to a part in one quadrillion. Topics covered include: (1) studies of the shuttle environment, including interference with the experiment, interfacing to the experiment, and possible alternatives; (2) numerical simulations of the proposed experiment, including analytic solutions for special cases of the mass motion and preliminary estimates of sensitivity and time required; (3) error analysis of several noise sources such as thermal distortion, gas and radiation pressure effects, and mechanical distortion; and (4) development and performance tests of a laboratory version of the instrument. A.R.H.

N85-18995*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

INVESTIGATION OF SURFACE TENSION PHENOMENA USING THE KC-135 AIRCRAFT

W. S. Alter Oct. 1982 16 p refs

(NASA-TM-82508; NAS 1.15:82508) Avail: NTIS HC A02/MF A01 CSCL 22A

The microgravity environment of the KC-135 aircraft was utilized in three experiments designed to determine the following: (1) the feasibility of measuring critical wetting temperatures; (2) the effectiveness of surface tension as a means of keeping the cushioning heat transfer liquid in the furnace during ampoule translation; and (3) whether a non-wetting fluid would separate from the ampoule wall under low gravity conditions. This trio of investigations concerning surface phenomena demonstrates the effectiveness of the KC-135 as a microgravity research environment for small-scale, hand-held experiments. R.S.F.

N85-18996*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

THE FEASIBILITY OF LOW-G GREY SOLIDIFICATION OF NODULAR IRON IN THE F-104 EXPERIMENTAL FURNACE PACKAGE

P. A. Curreri, G. A. Smith, and G. Workman Apr. 1983 20 p refs

(NASA-TM-82527; NAS 1.15:82527) Avail: NTIS HC A02/MF A01 CSCL 22A

The rationale for low-g experiments with cast iron and the need for solidification in the grey form during these experiments are reviewed. The factors which determine whether an iron melt will solidify grey or white are discussed. Cooling rate versus microstructure was studied for a nodular iron candidate material for F-104 low-g solidification. The study determined that low-g grey solidification, using the present F-104 furnace system, of the nodular iron composition studied is not feasible. Specimen microstructure strongly suggested that the F-104 furnace's gas cooling system was causing excessive localized chill resulting in

the nucleation of the unwanted iron carbide phase. A change is suggested, in the quench system design, that could possibly overcome this problem. Author

N85-19205# Joint Publications Research Service, Arlington, Va.
COMMERCIAL SPACE: EUROPE SHOULD HAVE INDEPENDENT STRATEGY
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 1-5 Transl. into ENGLISH from Aarde and Kosmos (Netherlands), Nov. - Dec. 1984 p 518-522 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N85-18997# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SEMIANALYTICAL, ARTIFICIAL SATELLITE ORBIT PROPAGATION PROCEDURE BASED ON OPTIMAL PARAMETER ESTIMATION
Wilson Custodio Canesin daSilva and Atair Rios Neto Oct. 1984 14 p refs Submitted for publication
(INPE-3301-PRE/613) Avail: NTIS HC A02/MF A01

A procedure to propagate the orbit of terrestrial artificial satellite using parameterized mathematical expression is presented. With numerically simulated observation data along one period and the help of linear systems estimation theory, particulary the Kalman filter technique, the parameters of the mathematical expressions are estimated. This allows approximate time variation equations for the orbital elements. Orbit propagation is then accomplished with considerable saving in computational efforts. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N85-18998*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NASA-VCOSS DYNAMIC TEST FACILITY
Henry B. Waites, Sherman M. Seltzer (Control Dynamics Co.), and George B. Doane, III Feb. 1985 21 p refs
(NASA-TM-86491; NAS 1.15:86491) Avail: NTIS HC A02/MF A01 CSCL 14B

The Large Space Structure Ground Test Facility under development at the NASA Marshall Space Flight Center in Huntsville, Alabama is described. The Ground Test Facility was established initially to test experimentally the control system to be used on the Solar Array flight Experiment. The structural dynamics of the selected test article were investigated, including the fidelity of the associated mathematical model. The facility must permit the investigation of structural dynamics phenomena and be able to evaluate candidate attitude control and vibration suppression techniques. B.W.

N85-18999# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEVELOPMENT OF THE TT AND C STATION EQUIPMENT AT INPE
Pawel Rozenfeld Oct. 1984 9 p Presented at the 4th Japan-Brazil Symp. on Sci. and Technol., 1984
(INPE-3327-PRE/625) Avail: NTIS HC A02/MF A01

The INPE TT&C stations are developed to be a multimission type, operated by only one operator in the routine phase, easily maintainable and of high availability. The description of how this philosophy is being implemented is discussed. Author

N85-19000*# System Planning Corp., Arlington, Va.
OPERATIONAL EFFECTIVENESS OF A MULTIPLE AQUILA CONTROL SYSTEM (MACS) Final Report
R. W. Brown, J. D. Flynn, and M. R. Frey Jul. 1983 73 p refs Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-100; JPL-956503)
(NASA-CR-174436; JPL-9950-884; NAS 1.26:174436; SPC-929)
Avail: NTIS HC A04/MF A01 CSCL 22D

The operational effectiveness of a multiple aquila control system (MACS) was examined under a variety of remotely piloted vehicle (RPV) mission configurations. The set of assumptions and inputs used to form the rules under which a computerized simulation of MACS was run is given. The characteristics that are to govern MACS operations include: the battlefield environment that generates the requests for RPV missions, operating time-lines of the RPV-peculiar equipment, maintenance requirements, and vulnerability to enemy fire. The number of RPV missions and the number of operation days are discussed. Command, control, and communication data rates are estimated by determining how many messages are passed and what information is necessary in them to support ground coordination between MACS sections. R.S.F.

N85-19001# Range Commanders Council, White Sands Missile Range, N. Mex. Data Reduction and Computing Working Group.
DIRECTORY OF RANGE DATA CONVERSION AND PROCESSING SYSTEMS
Oct. 1984 540 p Supersedes DR/CG-157-80
(AD-A148996; AD-E301513; DR/CG-157-84; DR/CG-157-80)
Avail: NTIS HC A23/MF A01 CSCL 16/1

A directory of range data conversion and processing systems is presented. Topics include: pre/post flight and real-time computer systems; film readers; frequency and wave analysis system; data transmission systems; printers and plotters; range instrumentation computer systems; telemetry front end systems; terminals and graphic Displays; and micrographics equipment. GRA

N85-19002# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONE ROCKET MULTIPLE SATELLITE LAUNCH TECHNOLOGY
K. Wu 2 Jun. 1982 7 p Transl. into ENGLISH from Hangkong Zhishi (China), no. 11, 1981 p 2-3
(AD-A149228; FTD-ID(RS)T-0391-82) Avail: NTIS HC A02/MF A01 CSCL 22/4

China has launched three satellites with one rocket. An astrophysical probe satellite has gone into orbit precisely and is functioning normally. According to a dispatch form the Peking office of the New China News Agency dated September 20, 1981, on that date China successfully launched an astrophysical probe satellite. This was the first time that China had used one carrier rocket to launch three satellites. The satellite entered orbit precisely, all systems were working normally, and it was transmitting back to Earth a continuous stream of scientific and experimental data. Author

N85-19320# Joint Publications Research Service, Arlington, Va.
MATRA HAS EUROPE'S LARGEST WHITE ROOM FOR SATELLITES
Alain Perez *In its* Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 52-53 Transl. into ENGLISH from Ind. et Tech. (Paris), 10 Nov. 1984 p 39 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-19003*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE SHUTTLE ORBITER TRIMMED CENTER-OF-GRAVITY EXTENSION STUDY Summary Report
William I. Scallion and W. Pelham Phillips Mar. 1985 53 p refs
(NASA-TP-2284; L-15701; NAS 1.60:2284) Avail: NTIS HC A04/MF A01 CSCL 22B

Aerodynamic, heat transfer, and system design studies to determine removable modifications for the Space Shuttle orbiter that would extend its forward center-of-gravity triom capability are summarized. Wind-tunnel tests were conducted at Mach numbers ranging from 0.25 to 20.3 to determine the most effective aerodynamic modifications. Heat transfer and system design studies determined the impact of the modifications on the thermal protection system and structural weight of the vehicle. The most effective modifications were in-fillet canards or a forward extension of the existing forward wing fillet. Author

N85-19004*# Astro Research Corp., Carpinteria, Calif.
EFFICIENT STRUCTURES FOR GEOSYNCHRONOUS SPACECRAFT SOLAR ARRAYS Final Report
Louis R. Adams 27 Sep. 1983 29 p refs
(Contracts NAS7-918; JPL-955847)
(NASA-CR-174448; JPL-9950-980; NAS 1.26:174448; ARC-TN-1125) Avail: NTIS HC A03/MF A01 CSCL 22B

A prototype deployer for the STACBEAM (Stacking Triangular Articulated Compact Beam) is being developed. The STACBEAM is an accordian-folded solar array blanket. The prototype was constructed as a point design for support of a 23.9-kW blanket and is described. B.G.

N85-19005# Naval Postgraduate School, Monterey, Calif.
MODELING AND SIMULATION OF A FIN ACTUATION SYSTEM Progress Report, Oct. 1983 - Sep. 1984
R. H. Nunn and R. J. Wright Dec. 1984 30 p
(AD-A149443; NPS69-84-011) Avail: NTIS HC A03/MF A01 CSCL 16/4

A study was begun to model and simulate a missile fin actuation system driven by a brushless dc motor. This report describes preliminary results in which the motor, drive-train and load were modeled using the usual linear descriptions. Simulation of system response to step and frequency inputs was accomplished using the Continuous System Modeling Program. Initial qualitative results show that the model successfully predicts the effects expected from variations in load and damping. Further evaluation of the model and possible refinements will require the availability of test data. GRA

N85-19006# Sandia Labs., Albuquerque, N. Mex.
EVALUATION OF INVISCID/BOUNDARY LAYER AND PARABOLIZED NAVIER-STOKES SOLUTIONS FOR DESIGN OF RE-ENTRY VEHICLES
M. McWherter, R. W. Noack, and W. L. Oberkampf Jun. 1984 21 p refs
(Contract DE-AC04-76DP-00789)
(DE84-014329; SAND-83-1366) Avail: NTIS HC A02/MF A01

Numerical predictions made by a traditional inviscid/boundary layer method and a parabolized Navier-Stokes method are compared with wind tunnel data for slender, blunted, cones at moderate angle of attack. Mach numbers ranged from 6 to 14 and Reynolds numbers from 0.4 to 16 million. The purpose of the comparison is to evaluate the Mach number and Reynolds number range of applicability of the two prediction methods. Also described are the practical aspects of using these two methods in a design environment. DOE

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-19007*# National Aeronautics and Space Administration, Washington, D. C.
SPACE TRANSPORTATION SYSTEM AND ASSOCIATED PAYLOADS: GLOSSARY, ACRONYMS, AND ABBREVIATIONS
Feb. 1985 309 p Previously announced as N81-16111
(NASA-RP-1059-Rev; NAS 1.61:1059-Rev) Avail: NTIS HC A14/MF A01 CSCL 22B

A collection of acronyms now in everyday use in the Shuttle world are listed. It is a combination of lists that were prepared at the Kennedy and Johnson Space Centers and by the Air Force. B.G.

N85-19008*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STUDY OF SEVERAL FACTORS AFFECTING CREW ESCAPE TRAJECTORIES FROM THE SPACE SHUTTLE ORBITER AT LOW-SUBSONIC SPEEDS
William I. Scallion, Bernard Spencer, Jr., George M. Ware, W. Pelham Phillips, Richard W. Powell, James C. Young, Carl L. Gentry, Jr., and Zachary T. Applin Washington Feb. 1985 70 p refs File Supplement L-1291 to this report is available on request from NASA. Langley Research Center, Hampton, Va.
(NASA-TM-86303; L-15839; NAS 1.15:86303) Avail: NTIS HC A04/MF A01 CSCL 22B

Factors affecting the bailout characteristics from the space shuttle orbiter at low-subsonic speeds were investigated. In the 12-foot low-speed tunnel and the 4 by 7-meter tunnel with 0.03-scale models. The effect of crew-model exit velocity, body position, and body weight were studied with egress from the main side hatch with the orbiter upright and from the upper cabin hatch with the orbiter inverted. Crew model drag and flow field measurements around the orbiter were estimated. The high-angle-of-attack trim characteristics of the orbiter was determined by force tests in an attempt to improve bailout conditions. A computer simulation was made to evaluate the maneuver necessary to attain the high-angle-of-attack trim. E.A.K.

N85-19009*# Teledyne Brown Engineering, Huntsville, Ala. Space Integration Div.
DATA REQUIREMENT (DR) MA-03: PAYLOAD MISSIONS INTEGRATION Progress Report, 17 Nov. 1984 - 15 Jan. 1985
28 Jan. 1985 47 p
(Contract NAS8-32712)
(NASA-CR-171331; NAS 1.26:171331; PMIC-MA03-469-35) Avail: NTIS HC A03/MF A01 CSCL 22B

Project management and payload integration requirements definition activities are reported. Mission peculiar equipment; systems integration; ground operations analysis and requirement definition; safety and quality assurance; and support systems development are examined for payloads planned for the following missions: EOM-1; SL-2; SI-3 Astro-1; MSL-2; EASE/ACCESS; MPESS; and the middeck ADSF flight. A.R.H.

N85-19010*# Tennessee Univ. Space Inst., Tullahoma. Atmospheric Science Div.
NATURAL ENVIRONMENT ANALYSIS
Walter Frost 31 Jan. 1985 68 p refs
(Contract NAS8-35973)
(NASA-CR-171333; NAS 1.26:171333) Avail: NTIS HC A04/MF A01 CSCL 22B

The influence of terrain features on wind loading of the space shuttle while on the launch pad, or during early liftoff, was investigated both qualitatively and quantitatively. The climatology and meteorology producing macroscale wind patterns and characteristics for the Vandenburg Air Force Base launch site are described. Field test data are analyzed, and the nature and

characteristic of flow disturbances due to the various terrain features, both natural and man-made, are reviewed. The magnitude of these wind loads are estimated. Finally, effects of turbulence are discussed. It is concluded that the influence of complex terrain can create significant wind loading on the vehicle. R.S.F.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-19011*# Rockwell International Corp., Pittsburgh, Pa. Space Station Systems Div.
GROUND TEST ARTICLE FOR DEPLOYABLE SPACE STRUCTURE SYSTEMS Bimonthly Report
G. D. Malloy Jan. 1985 7 p
(Contract NAS8-34657)
(NASA-CR-171301; NAS 1.26:171301; BMR-5) Avail: NTIS HC A02/MF A01 CSCL 22B

Santek's ability to recover from a schedule slip was reviewed and found satisfactory. Diagonal member bond joints were subjected to static load to failure tests. Results are considered adequate. B.G.

N85-19012*# Martin Marietta Aerospace, Denver, Colo.
OPERATIONAL FITNESS OF BOX TRUSS ANTENNAS IN RESPONSE TO DYNAMIC SLEWING Final Report
E. E. Bachtell, S. S. Bettadapur, W. A. Schartel, and L. A. Karanian Jan. 1985 100 p
(Contract NAS1-17551)
(NASA-CR-172470; NAS 1.26:172470; MCR-84-594) Avail: NTIS HC A05/MF A01 CSCL 22B

A parametric study was performed to define slewing capability of large satellites along with associated system changes or subsystem weight and complexity impacts. The satellite configuration and structural arrangement from the Earth Observation Spacecraft (EOS) study was used as the baseline spacecraft. Varying slew rates, settling times, damping, maneuver frequencies, and attitude hold times provided the data required to establish applicability to a wide range of potential missions. The key elements of the study are: (1) determine the dynamic transient response of the antenna system; (2) calculate the system errors produced by the dynamic response; (3) determine if the antenna has exceeded operational requirements at completion of the slew, and if so; (4) determine when the antenna has settled to the operational requirements. The slew event is not considered complete until the antenna is within operational limits. Author

N85-19013*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GROUND TEST EXPERIMENT FOR LARGE SPACE STRUCTURES
Danny K. Tollison (Control Dynamics Co.) and Henry B. Waites Feb. 1985 11 p
(NASA-TM-86489; NAS 1.15:86489) Avail: NTIS HC A02/MF A01 CSCL 22B

In recent years a new body of control theory has been developed for the design of control systems for Large Space Structures (LSS). The problems of testing this theory on LSS hardware are aggravated by the expense and risk of actual in orbit tests. Ground tests on large space structures can provide a proving ground for candidate control systems, but such tests require a unique facility for their execution. The current development of such a facility at the NASA Marshall Space Flight Center (MSFC) is the subject of this report. Author

N85-19014*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ACTIVE CONTROL OF LARGE SPACE STRUCTURES: AN INTRODUCTION AND OVERVIEW
George B. Doane, III, Danny K. Tollison, and Henry B. Waites Feb. 1985 11 p refs
(NASA-TM-86490; NAS 1.15:86490) Avail: NTIS HC A02/MF A01 CSCL 22B

An overview of the large space structure (LSS) control system design problem is presented. The LSS is defined as a class of system, and LSS modeling techniques are discussed. Model truncation, control system objectives, current control law design techniques, and particular problem areas are discussed. Author

N85-19015*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SWING-ARM BEAM ERECTOR (SABER) CONCEPT FOR SINGLE ASTRONAUT ASSEMBLY OF SPACE STRUCTURE
Judith J. Watson, Walter L. Heard, Jr., and J. Kermit Jensen (Kentron International, Inc.) Mar. 1985 32 p refs
(NASA-TP-2379; L-15886; NAS 1.60:2379) Avail: NTIS HC A03/MF A01 CSCL 22B

Results are presented of tests conducted to evaluate a mobile work station/assembly fixture concept that would mechanically assist an astronaut in the on-orbit manual assembly of erectable truss-beams. The concept eliminates astronaut manual translation by use of a motorized work platform with foot restraints. The tests involved assembly of a tetrahedral truss-beam by a test subject in simulated zero gravity (neutral bouyancy in water). A three-bay truss-beam was assembled from 30 aluminum struts with quick-attachment structural joints. The results show that average on-orbit assembly rates of 2.1 struts per minute can be expected for struts of the size employed in these tests. Author

N85-19206# Joint Publications Research Service, Arlington, Va.
BRITISH AEROSPACE STUDIES HOTOL SATELLITE LAUNCHER
In its West Europe Rept.: Sci. and Technol. (JPRS-WT-85-004) 30 Jan. 1985 p 6-8 Transl. into ENGLISH from Aarde and Kosmos (Netherlands), Nov. - Dec. 1984 p 536 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N85-19016*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFRARED HORIZON SENSOR MODELING FOR ATTITUDE DETERMINATION AND CONTROL: ANALYSIS AND MISSION EXPERIENCE
M. C. Phenneger (Computer Sciences Corp., Silver Spring, Md.), S. P. Singhal (Computer Sciences Corp., Silver Spring, Md.), T. H. Lee (Computer Sciences Corporation, Silver Spring, Md.), and T. H. Stengle Mar. 1985 460 p refs
(NASA-TM-86181; Rept-85B0147; NAS 1.15:86181) Avail: NTIS

HC A20/MF A01 CSCL 14B

The work performed by the Attitude Determination and Control Section at the National Aeronautics and Space Administration/ Goddard Space Flight Center in analyzing and evaluating the performance of infrared horizon sensors is presented. The results of studies performed during the 1960s are reviewed; several models for generating the Earth's infrared radiance profiles are presented; and the Horizon Radiance Modeling Utility, the software used to model the horizon sensor optics and electronics processing to computer radiance-dependent attitude errors, is briefly discussed. Also provided is mission experience from 12 spaceflight missions spanning the period from 1973 to 1984 and using a variety of horizon sensing hardware. Recommendations are presented for future directions for the infrared horizon sensing technology.

Author

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-19017*# CHAM of North America, Inc., Huntsville, Ala.
SSME THRUST CHAMBER SIMULATION USING NAVIER-STOKES EQUATIONS Final Report
A. J. Przekwas, A. K. Singhal, and L. T. Tam Oct. 1984 115 p refs
(Contract NAS8-35559)
(NASA-CR-171349; NAS 1.26:171349; CHAM-4070/3) Avail: NTIS HC A06/MF A01 CSCL 21H

The capability of the PHOENICS fluid dynamics code in predicting two-dimensional, compressible, and reacting flow in the combustion chamber and nozzle of the space shuttle main engine (SSME) was evaluated. A non-orthogonal body fitted coordinate system was used to represent the nozzle geometry. The Navier-Stokes equations were solved for the entire nozzle with a turbulence model. The wall boundary conditions were calculated based on the wall functions which account for pressure gradients. Results of the demonstration test case reveal all expected features of the transonic nozzle flows. Of particular interest are the locations of normal and barrel shocks, and regions of highest temperature gradients. Calculated performance (global) parameters such as thrust chamber flow rate, thrust, and specific impulse are also in good agreement with available data. R.S.F.

N85-19018# National Aerospace Lab., Tokyo (Japan).
PARTIAL BLEED EXPANDER CYCLE FOR LOW THRUST LOX/LH2 ROCKET ENGINE
Yoshio Wakamatsu, Akio Kanmnuri, and Kyoichiro Toki (Inst. of Space and Astronautical Science) Sep. 1984 13 p refs
(NAL-TR-837T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The expander cycle or the coolant bleed cycle LOX/LH2 engine is considered suitable for use with the orbit transfer vehicle and the upper stage of a conventional rocket because of their simplicity of engine system. However, these engine cycles generally require a thrust chamber with a high expansion area ratio in order to obtain a high performance and necessarily require a High Altitude Test Facility even in the initial phase of development. A new engine cycle called the 'Partial Bleed Expander (PBE) cycle is proposed. In the PBE cycle, only the turbopump of one propellant (usually LH2) is driven in the expander cycle and a portion of fuel is bled to drive the turbopump of the other propellant (usually LOX). The bled fuel may be utilized for dump cooling or film cooling. From the calculation of the PBE cycle, it was clear that the PBE cycle can perform at a level close to that of the expander cycle with the bleeding rate resulting in minimum ISp loss. B.W.

N85-19019*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
THRUST CHAMBER PERFORMANCE USING NAVIER-STOKES SOLUTION Final Report
John S. Chan and Jon A. Freeman 12 Dec. 1984 91 p refs
(Contract NAS8-35987)
(NASA-CR-171346; NAS 1.26:171346; LMSC-HREC-TR-D951729) Avail: NTIS HC A05/MF A01 CSCL 21H

The viscous, axisymmetric flow in the thrust chamber of the space shuttle main engine (SSME) was computed on the CRAY 205 computer using the general interpolants method (GIM) code. Results show that the Navier-Stokes codes can be used for these flows to study trends and viscous effects as well as determine flow patterns; but further research and development is needed before they can be used as production tools for nozzle performance calculations. The GIM formulation, numerical scheme, and computer code are described. The actual SSME nozzle computation showing grid points, flow contours, and flow parameter plots is discussed. The computer system and run times/costs are detailed. A.R.H.

N85-19020*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
DESIGN AND ANALYSIS REPORT FOR THE RL10-2B BREADBOARD LOW THRUST ENGINE Final Report
James R. Brown, Robert R. Foust, Donald E. Galler, Paul G. Kanic, Thomas D. Kmiec, Charles D. Limerick, Richard J. Peckham, and Thomas Swartwout 12 Dec. 1984 138 p
(Contract NAS3-24238)
(NASA-CR-174857; NAS 1.26:174857; FR-18046-3) Avail: NTIS HC A07/MF A01 CSCL 21H

The breadboard low thrust RL10-2B engine is described. A summary of the analysis and design effort to define the multimode thrust concept applicable to the requirements for the upper stage vehicles is provided. Baseline requirements were established for operation of the RL10-2B engine under the following conditions: (1) tank head idle at low propellant tank pressures without vehicle propellant conditioning or settling thrust; (2) pumped idle at a ten percent thrust level for low G deployment and/or vehicle tank pressurization; and (3) full thrust (15,000 lb.). Several variations of the engine configuration were investigated and results of the analyses are included. Author

N85-19021*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
ADVANCED ION THRUSTER RESEARCH Annual Report, 1 Oct. 1983 - 1 Nov. 1984
Paul J. Wilbur Jan. 1985 63 p refs
(Grant NGR-06-002-112)
(NASA-CR-174862; NAS 1.26:174862) Avail: NTIS HC A04/MF A01 CSCL 21C

A series of experiments conducted on a ring cusp magnetic field ion thruster; in which the anode, cathode and discharge chamber backplate were moved relative to the magnetic cusp; are described. Optimum locations for the anode, cathode and backplate which yield the lowest energy cost per plasma ion and highest extracted ion fraction are identified. The results are discussed in terms of simple physical models. The results of preliminary experiments into the operation of hollow cathodes on nitrogen and xenon over a large pressure range (<0.1 to >100 Torr) are presented. They show that the cathode discharge transfers from the cathode insert to the exterior edge of the orifice plate as the interelectrode pressure is increased. Experimental evidence showing that a new ion extractor grid concept can be used to stabilize the plasma sheath at the screen grid is presented. This concept, identified by the term constrained sheath optics, is shown to hold ion beamlet divergence and impingement characteristics to stable values as the beamlet current and the net and total accelerating voltages are changed. The current status of a study of beamlet vectoring induced by displacing the accelerator and/or decelerator grids of a three grid ion extraction system relative to the screen grid is discussed. Author

N85-19022# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
A DIFFUSER HEAT TRANSFER CODE Final Report, 1 Oct. 1982 - 30 Sep. 1983
G. H. Buzzard Nov. 1984 48 p
(AD-A149270; AFRPL-TR-84-060) Avail: NTIS HC A03/MF A01 CSCL 21/8

A computer code for diffuser heat transfer analysis (DHT) has been developed which improves upon the earlier Rocket Engine Diffuser Thermal Analysis Program (REDTAP) of Trout and McCay. Improvements contained within DHT include provision for a radial temperature gradient within the diffuser wall, treatment of impingement heat transfer at the point of plume attachment, an improved model for the particle impingement accommodation coefficient, and a model for particle debris shielding. The 77-inch diffuser located at the Air Force Rocket Propulsion Laboratory was instrumented to record the water side diffuser wall temperature and water jacket temperature at selected sites along the initial seven feet of the diffuser during routine test firings. Comparison of the predictions of DHT and preliminary experimental data show promise but as of the present time inadequate experimental data exist to allow a validation of the code. GRA

N85-19023# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hardthausen (West Germany). Inst. fuer Chemische Antriebe und Verfahrenstechnik.
ANALYSIS AND OPTIMIZATION OF SMALL SPACE SHUTTLE PROPULSION PLATFORMS Ph.D. Thesis - Technische Univ., Berlin
Detlef Manski Feb. 1984 215 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-901)
(DFVLR-FB-84-28) Avail: NTIS HC A10/MF A01; DFVLR, Cologne DM 63

Analytical models were developed to analyze payload transport from space shuttles. The models allow for different transfer stage configurations, the mass of rocket engines, the performance of rocket propellants, and the cost of upper rocket stages. A trajectory calculation model allows space missions to be studied. Only the cost is chosen as a variable for the parametrical presentation of the results. Optimal propulsion platforms for three mission ranges are proposed. For minimum velocity requirements the platform is characterized by isotensoidal tank, hydrazine, and super-blowdown feed system. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N85-19024*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
RESISTANCE FAIL STRAIN GAGE TECHNOLOGY AS APPLIED TO COMPOSITE MATERIALS
M. E. Tuttle and H. F. Brinson Washington NASA Feb. 1985 44 p
(Contract NCC2-71)
(NASA-CR-3872; NAS 1.26:3872; VPI-E-83-19) Avail: NTIS HC A03/MF A01 CSCL 11D

Existing strain gage technologies as applied to orthotropic composite materials are reviewed. The bonding procedures, transverse sensitivity effects, errors due to gage misalignment, and temperature compensation methods are addressed. Numerical examples are included where appropriate. It is shown that the orthotropic behavior of composites can result in experimental error which would not be expected based on practical experience with isotropic materials. In certain cases, the transverse sensitivity of strain gages and/or slight gage misalignment can result in strain measurement errors. R.S.F.

N85-19025*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
EVALUATION OF FAILURE CRITERION FOR GRAPHITE/EPOXY FABRIC LAMINATES Interim Report, Aug. 1983 - Dec. 1984
R. C. Tennyson and G. E. Wharram Feb. 1985 46 p refs
(Grant NsG-7409)
(NASA-CR-172547; NAS 1.26:172547) Avail: NTIS HC A03/MF A01 CSCL 11D

The development and application of the tensor polynomial failure criterion for composite laminate analysis is described. Emphasis is given to the fabrication and testing of Narmco Rigidite 5208-WT300, a plain weave fabric of Thornel 300 Graphite fibers impregnated with Narmco 5208 Resin. The quadratic-failure criterion with F sub 12=0 provides accurate estimates of failure stresses for the graphite/epoxy investigated. The cubic failure criterion was recast into an operationally easier form, providing design curves that can be applied to laminates fabricated from orthotropic woven fabric prepregs. In the form presented, no interaction strength tests are required, although recourse to the quadratic model and the principal strength parameters is necessary. However, insufficient test data exist at present to generalize this approach for all prepreg constructions, and its use must be restricted to the generic materials and configurations investigated to date. Author

N85-19026*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
PRELIMINARY REPORT ON TESTS OF TENSILE SPECIMENS WITH A PART-THROUGH SURFACE NOTCH FOR A FILAMENT WOUND GRAPHITE/EPOXY MATERIAL
C. E. Harris and D. H. Morris Mar. 1985 35 p refs
(Grant NAG1-343)
(NASA-CR-172545; NAS 1.26:172545) Avail: NTIS HC A03/MF A01 CSCL 11D

The behavior of tensile coupons with surface notches of various semi-elliptical shapes were evaluated for specimens obtained from a filament wound graphite/epoxy cylinder. The quasi-static test results, in some instances, are inadequate for defining complete trend curves and the interpretive analysis is considered to be preliminary. Specimens with very shallow notches were observed to be notch insensitive and the unnotched strength from these specimens was determined to be 54.97 Ksi. The failure strain of the laminate was found to be 1.328%. Specimens with deeper notches were sensitive to notch depth, notch aspect ratio, and specimen width. Using the unnotched strength of 54.97 Ksi and Poe's general toughness parameter, the fracture toughness was estimated to be 27.2 Ksi square root of In. Isotropic linear elastic fracture mechanics together with the estimated fracture toughness correctly predicted the influence of notch depth, aspect ratio, and specimen finitewidth. Author

N85-19027# General Electric Co., Schenectady, N. Y.
ADVANCED ARTIFICIAL DIELECTRIC MATERIALS FOR MILLIMETER WAVELENGTH APPLICATIONS Annual Technical Report, 1 Aug. 1983 - 30 Sep. 1984
I. S. Jacobs 26 Oct. 1984 54 p
(Contract N00014-83-C-0447; RR0-2202)
(AD-A148960) Avail: NTIS HC A04/MF A01 CSCL 20/3

An artificial dielectric polymeric composite containing alloy particles which are oxide-coated for isolation and ferromagnetic below room temperature for packing determination, is described. Induced magnetic dipole effects are calculated and compared with measurements of complex permeability in the centimeter wave-

length range. Dielectric behavior, according to various theoretical model of heterogeneous media, is explored and correlated to experimental systems. Evidence of higher-order multipole effects and packing-limit effects in random composites is presented. Several advanced preparation techniques for fine powder were initiated. Author (GRA)

N85-19028# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
A COMPREHENSIVE STUDY ON SUBLAMINATE CRACK GROWTH STABILITY AND ITS EFFECTS ON THE LOAD-CARRYING CAPACITY Final Report, 1 Oct. 1981 - 30 Sep. 1983
A. S. D. Wang and F. W. Crossman (Lockheed Missiles and Space Co., Palo Alto, Calif.) Mar. 1984 195 p Prepared in cooperation with Lockheed Palo Alto Research Lab., Palo Alto CA
(Contract F49620-79-C-0206)
(AD-A149037; AFOSR-84-1127TR) Avail: NTIS HC A09/MF A01 CSCL 11/4

This report highlights the development of a unified method for the formation mechanisms of matrix-dominated cracks in a class of structural laminates that are made by using unidirectionally fiber reinforced composite plies. Because of the collimated reinforcement structure exhibited in this class of laminates, the growth of an individual matrix crack is confined either in the fiber-matrix interface or in the ply-to-ply interface. The former occurs as intraply crack caused by primarily by in-ply stresses, while the latter occurs as interply crack caused by interlaminar stresses. These are the two fundamental modes exhibited in matrix cracking. Experiments using graphite-epoxy composite systems have established that matrix cracking is actually a process in which a great number of similar cracks occur during the course of loading. The multiplicity in the crack formation process stems from the existence of material flaws which distribute randomly throughout the laminate, and from the internal reinforcement structure which inhibits individual crack from growing into large proportions. When viewed at the ply level, growth of a matrix crack is essentially brittle in nature; its growth path initially follows one of the two fundamental modes. When blunted, the initial mode may turn to the other mode. Thus, the individual growth path may be considered as piece-wise self-similar. GRA

N85-19029# Institute for Defense Analyses, Alexandria, Va.
PROCEEDINGS OF COLLOQUIUM/WORKSHOP ON COMPOSITE MATERIALS AND STRUCTURES, STANDARDIZATION, QUALIFICATION, CERTIFICATION HELD AT WASHINGTON, D.C. ON 8-10 MAY 1984 Final Report, Jan. - Jun. 1984
S. L. Channon Jul. 1984 533 p
(Contract MDA903-84-C-0031)
(AD-A149039; IDA-D-70) Avail: NTIS HC A23/MF A01 CSCL 11/4

The Colloquium/Workshop was organized as a 3 day program, the first day was devoted to a series of short overviews from Government, industry and standards organizations. The second day was devoted to discussions in four separate working groups covering the following topics: Fibers and reinforcements, matrix materials, intermediate products, and components and structures. On the third day, summaries of the working group discussions and recommendations were presented in a general session, followed by a period of open discussion. This document contains the presentations by individual speakers and the summary reports by the work group chairmen. GRA

N85-19030# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
COMPOSITIONAL, STRUCTURAL, AND PHYSICAL STUDIES OF SOME GRAPHITE HEXAFLUOROARSENATES AND THEIR RELATIVES Ph.D. Thesis
Fujio Okino Sep. 1984 143 p refs
(Contract DE-AC03-76SF-00098)
(DE85-000855; LBL-18261) Avail: NTIS HC A07/MF A01

The chemical composition of graphite + AsF5, + AsF5/F2, and + O2AsF6 reaction products is described along with the relationship of those products to the I sub c spacing. Structural models are advanced for C14AsF6 and (C sub x) As(F sub y) where ($8 < x < 14$) and ($5 < y < 6$). The structural models for C14 AsF6 are subjected to mathematical treatment. Finally, reactions of (C14n)AsF6 with AsF5, AsF3, and F2 are considered together with electrical conductivity measurements. R.S.F.

N85-19031# California Univ., Livermore. Lawrence Livermore Lab.
MECHANICS OF COMPOSITE MATERIALS
R. M. Christensen 9 Jan. 1984 14 p refs Presented at the 29th Natl. SAMPE Symp., Reno, Nev., 3 Apr. 1984
(Contract W-7405-eng-48)
(DE85-003611; UCRL-90195; CONF-840459-6) Avail: NTIS HC A02/MF A01

The means of predicting the mechanical properties of composite materials in terms of the microstructure properties are assessed. Fiber reinforced composites are considered as well as other types of heterogeneous combinations of materials. Various geometric models of microstructure characteristics are discussed. Primary emphasis is given to elasticity results. DOE

N85-19094# Joint Publications Research Service, Arlington, Va.
MECHANICAL PROPERTIES OF Be-Al COMPOSITE Abstract Only
G. I. Volokita and G. Ye. Pletenetskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 8 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 110-112 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19095# Joint Publications Research Service, Arlington, Va.
CALCULATING RESIDUAL STRESSES IN COMPOSITE MATERIALS Abstract Only
A. I. Yepishin, Ye. N. Pirogov, and V. P. Konoplenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 9 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 113-117 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19096# Joint Publications Research Service, Arlington, Va.
SPREADING UPON COMPACTING OF FIBER COMPOSITE MATERIALS WITH POROUS METAL MATRIX Abstract Only
B. A. Arefyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 9 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19097# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF VOLUMETRIC FIBER CONTENT ON SOME MATRIX DAMAGE FACTORS DURING THERMAL CYCLING OF TUNGSTEN-EI 765 COMPOSITE Abstract Only
V. I. Yeremenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 10 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 101-105 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19098# Joint Publications Research Service, Arlington, Va.
STUDY OF SURFACE DAMAGE IN CATHODE COMPOSITE MATERIALS IN A HIGH FLUX CO2 LASER Abstract Only
G. G. Gnesin, G. V. Levchenko, R. B. Luban, V. A. Barsuk, V. M. Nesterenko, and M. Z. Filimonov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 10-11 Transl. into ENGLISH from Poverkhnost (Moscow), no. 7, Jul. 1984 p 107-111 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19099# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE ESTIMATE OF COMPATIBILITY OF FIBER COMPOSITE MATERIAL COMPONENTS Abstract Only

A. A. Zabolotskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 11 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 4, Apr. 1984 p 22-28 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19100# Joint Publications Research Service, Arlington, Va.
STUDIES OF STRUCTURE AND MECHANICAL PROPERTIES OF CARBON-REINFORCED PLASTIC BASED ON SPIRALLY REINFORCED FILLER Abstract Only
G. Ye. Freger and B. B. Ignatyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 12 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 3, May - Jun. 1984 p 397-401 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19101# Joint Publications Research Service, Arlington, Va.
THE PROBLEM OF PROTECTING THE STRUCTURE OF A PACKET COMPOSITE OF OPTIMAL THINWALL ELEMENTS Abstract Only
Yu. S. Nshinyan *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 12-13 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19102# Joint Publications Research Service, Arlington, Va.
LASER RUPTURE OF COMPOSITE MATERIALS Abstract Only
A. A. Rassokha *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 13 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 3, May - Jun. 1984 p 462-465 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19103# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND PROPERTY FORMATION MECHANISM IN MAGNETITE ALLOY-BINDER COMPOSITE Abstract Only
T. Ya. Malysheva, V. Yu. Zozulya, P. D. Rabina, L. D. Kuznetsov, O. A. Dolitskaya, I. I. Podolskiy, A. M. Alekseyev, and V. N. Yefremov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 14-15 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Met. (Moscow), no. 4, Jul. - Aug. 1984 p 3-9 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19104# Joint Publications Research Service, Arlington, Va.
IMPACT TOUGHNESS OF COMPOSITES WITH LAYERED MICROSTRUCTURE OF OT4 TITANIUM ALLOY Abstract Only
V. N. Rodionov and V. V. Peshkov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 15 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Tsvetnaya Met. (Ordzhonikidze, USSR), no. 3, May - Jun. 1984 p 111-113 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19105# Joint Publications Research Service, Arlington, Va.
FIBER COMPOSITE MATERIALS WITH TITANIUM MATRIX Abstract Only
V. I. Bakarinova, M. Kh. Shorshorov, and V. N. Meshcheryakov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 16 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 90-96 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19108# Joint Publications Research Service, Arlington, Va.
TEMPERATURE VARIATION OF LASER MIRROR STABILITY CRITERIA Abstract Only
S. B. Koshelev and V. V. Kharitonov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 18 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 139-141 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19113# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF PRODUCTION OF COMPOSITE DIAMOND-CONTAINING MATERIALS USING TITANIUM CARBIDE-STEEL ALLOYS Abstract Only
V. K. Narva, N. S. Loshkareva, A. M. Akhmedzyanova, E. S. Simkin, S. I. Sklyar, and N. V. Tsypin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 30 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 7, Jul. 1984 p 21-25 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19118# Joint Publications Research Service, Arlington, Va.
BEHAVIOR AND SPECIFICS OF FRACTURE OF POROUS FIBER MATERIALS IN EXTENSION Abstract Only
A. G. Kostornov and L. G. Galstyan *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 34-35 Transl. into ENGLISH from Porosh. Met. (Kiev), no. 7, Jul. 1984 p 83-86 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19119# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF GASEOUS HYDROGEN ON STRENGTH AND DUCTILITY OF NICKEL HEAT-RESISTANT ALLOYS Abstract Only
G. G. Maksimovich, V. I. Kholodnyy, V. I. Belov, I. Yu. Tretyak, L. M. Ivaskevich, and T. V. Slipchenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 36 Transl. into ENGLISH from Fiz.-Khim. Mekh. Mater. (Kiev), v. 20, no. 3, May - Jun. 1984 p 53-56 Original language doc. was announced in IAA as A84-41792 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-19032*# Cooper Union, New York.
THEORETICAL STUDIES OF THE IGNITION AND COMBUSTION OF SILANE-HYDROGEN-AIR MIXTURES Final Report
Wallace Chinitz Washington NASA Feb. 1985 45 p refs
(Grant NAG1-18)
(NASA-CR-3876; NAS 1.26:3876) Avail: NTIS HC A03/MF A01 CSCL 21B

A chemical kinetic mechanism is proposed for the combustion of silane-hydrogen-oxygen-nitrogen mixtures in the initial temperature range from 800K to 1250K and pressure range from 0.5 to 1.35 atm. The mechanism yields results which are in agreement with published ignition delay times obtained from shock tube experiments. Comparisons between the results obtained using the proposed mechanism and that of an alternative mechanism reveal that the former predicts appreciably shorter ignition delay times, but a flame blowout envelope which is shifted so as to decrease the stable flame region. Over much of the thermodynamic range examined, the mechanism predicts long reaction times. A three step global mechanism is proposed which closely models the ignition phase of SiH4 - H2 - air combustion; however, the reaction phase is less well reproduced by the global model. The necessity for additional experimental data to further assess the proposed models is stressed. Author

N85-19033*# Engineering Research West, Santa Monica, Calif.
ECUT, ENERGY CONVERSION AND UTILIZATION TECHNOLOGIES PROGRAM: ISOTHERMAL SEPARATION PROCESSES UPDATE

Christopher England Aug. 1984 48 p refs Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contracts JPL-956171; DE-AI01-81CS-66001)
(NASA-CR-175463; JPL-9950-927; NAS 1.26:175463;
DOE/CS-66001/6) Avail: NTIS HC A03/MF A01 CSCL 07D

The isothermal processes of membrane separation, supercritical extraction, and condensed-phase chromatography were examined using availability analysis, a method which addresses the thermodynamic value of energy as well as its amount. Equations were derived that identified where energy, expressed in terms of thermodynamic work, is consumed in these processes and how they compare with conventional separation methods. These separation methods are characterized by pure work inputs, chiefly in the form of a pressure drop which supplies the required energy. Equations were derived for the energy requirement in terms of the theories of ideal and regular solutions. This approach is believed to accurately predict the work of separation in terms of the heat of solution and the entropy of mixing. Close examination of supercritical extraction found a relatively simple thermodynamic relationship among the thermodynamic properties of the solvent, the entropy of mixing, and the heat of solution. This allows a direct estimate of the work requirements. R.S.F.

N85-19034*# Chem Systems, Inc., Tarrytown, N.Y.
ECUT, ENERGY CONVERSION AND UTILIZATION TECHNOLOGIES PROGRAM: TECHNICAL AND ECONOMIC ASSESSMENT OF PROCESSES FOR THE PRODUCTION OF BUTANOL AND ACETONE. PHASE 2: ANALYSIS OF RESEARCH ADVANCES Final Report
Aug. 1984 143 p Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-918; JPL-956277; DE-AI01-81CS-66001)
(NASA-CR-175471; JPL-9950-928; NAS 1.26:175471;
DOE/CS-66001/5) Avail: NTIS HC A07/MF A01 CSCL 07D

Parametric estimates are provided of the economic and energy impacts of a variety of research advances in the hydrolysis, fermentation, and purification sections of the butanol/acetone fermentation (ABE) process. The research advances analyzed were based on a comprehensive literature review. The six process options studied were: (1) continuous ABE fermentation; (2) vacuum ABE fermentation; (3) Baelene solvent extraction; (4) HRI's Lignol process; (5) improved prehydrolysis/dual enzyme hydrolysis; and (6) improved microorganism tolerance to butanol toxicity. Of the six options analyzed, only improved microorganism tolerance to butanol toxicity had a significant positive effect on energy efficiency and economics. This particular process option reduced the base case production cost (including 10% DCF return) by 20% and energy consumption by 16%. R.S.F.

N85-19035# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INVESTIGATION ON THE BURNING OF UNPULVERIZED COAL IN A SELF EXCITED ACOUSTIC FIELD
Joao Andrade deCarvalho, Jr., Ben T. Zinn, Nehemia Miller, and Muh R. Wang Oct. 1984 12 p refs Presented at the 3rd Brazil. Congr. of Energy, Rio de Janeiro, Oct. 1984
(INPE-3295-PRE/610) Avail: NTIS HC A02/MF A01

Results obtained from the burning of unpulverized coal in a Rijke type pulsating combustor are presented. The developed combustor consists of an open-ended tube where a fuel burning bed is located in the middle of its lower half. The release of heat in this location excites the fundamental acoustic mode of the tube and the resulting oscillations lead to a very intense and efficient combustion process. The main performance data presented include combustion efficiencies, heat release, and transfer rates. Author

N85-19036*# National Aeronautics and Space Administration, Washington, D. C.
VAPOR PRESSURE AND EVAPORATION RATE OF CERTAIN HEAT-RESISTANT COMPOUNDS IN A VACUUM AT HIGH TEMPERATURES
A. S. Bolgar, T. S. Verkhoglyadova, and G. V. Samsonov Feb. 1985 11 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Otd. Tekhn. Nauk, Met. i Toplivo (USSR), no. 1, 1981 p 142-145 Transl. by The Corporate Word, Pittsburgh
(Contract NASw-4006)
(NASA-TM-77807; NAS 1.15:77807) Avail: NTIS HC A02/MF A01 CSCL 07D

The vapor pressure and evaporation rate of borides of titanium, zirconium, and chrome; and of strontium and carbides of titanium, zirconium, and chrome, molybdenum silicide, and nitrides of titanium, niobium, and tantalum in a vacuum were studied. It is concluded that all subject compounds evaporate by molecular structures except AlB sub 12' which dissociates, losing the aluminum. E.A.K.

N85-19037# Georgia Tech Research Inst., Atlanta. Energy and Material Sciences Lab.
A PROGRAM TO DEVELOP THERMITE REACTIONS TO PRODUCE REFRACTORY BORIDES AND CARBIDES Interim Report, 1 Jun. 1983 - 31 Jan. 1984
K. V. Logan and J. D. Walton Sep. 1984 63 p
(Contract DAAG46-83-K-0163)
(AD-A148972; AMMRC-TR-84-38) Avail: NTIS HC A04/MF A01 CSCL 13/8

The objective of this research program is to determine the potential of the thermite reaction for producing high density refractory boride shapes by melt casting. Emphasis is being placed on developing experimental compositions, processing procedures and ignition conditions which will maximize the temperature obtained from the thermite reaction and affect the melting and separation of the reaction products. Phase 1 of the research effort evaluated the effects of three process parameters: particle size, powder compaction and temperature of reactants at ignition. The products of ignition were characterized using electron microscopy and X-ray diffraction to determine the extent of the reaction towards completion and the compounds produced by the ignition. Three systems were investigated: TiO2 + Al; B2O3 + Al; and TiO2 + B2O3 + Al. A TiB2 + alpha Al2O3 product was obtained by using the thermite reaction to reduce TiO2 + B2O3. Samples containing small particle size aluminum in a loose powder ignited at a lower temperature than compacted samples containing coarse aluminum. Samples ignited in a preheated furnace showed a more complete reaction than those ignited at room temperature. GRA

N85-19038# Eltron Research, Inc., Aurora, Ill.
A TWO PHOTOELECTRODE SOLID-STATE PHOTOELECTROCHEMICAL CELL
A. F. Sammells and S. K. Schmidt 14 Sep. 1984 13 p
(Contract N00014-83-C-0108)
(AD-A148982; AD-E301513; Rept-0002AE) Avail: NTIS HC A02/MF A01 CSCL 07/4

The solid-state photoelectrochemical cell p-InP/C44H28N4Fe (+3) Porphine, Nafion 117/Nafion 117/(bpy)3Ru(2+), Nafion 117/n-Cds was prepared and given photopotentials in excess of 1100mV and appears to be a novel approach for not only specialized storage devices but also in specific detector applications. GRA

N85-19039# Geo-Centers, Inc., Newton, Mass.
THE REACTION OF OXYGEN-NITROGEN MIXTURES WITH GRANULAR ACTIVATED CARBONS BELOW THE SPONTANEOUS IGNITION TEMPERATURE
Aug. 1984 29 p
(Contract N00014-83-C-2184)
(AD-A149041; GC-TR-84-385) Avail: NTIS HC A03/MF A01 CSCL 07/3

The presence of oxygen in the carbon network of gas adsorbent charcoals presents a research problem of long standing. Four pertinent topics now concerned with the oxygen-charcoal reactions are: (1) activation of the adsorbent charcoals (manufacture), (2) regeneration processes (applications), (3) the spontaneous ignition temperature (safety considerations), and (4) the use of charcoals as catalyst carriers and impregnation supports. It is desirable to have a deeper knowledge of the initial surface composition of a charcoal that is to be used in a specific process.

Thermal desorption behavior can supply such information. The results to be reported cover three characteristic temperature-dependent phenomena: (1) an anomalous desorption in which a number of maxima occur in the concentrations of CO and CO2; (2) the formation of a surface barrier causing a decay in the CO and CO2 concentrations with the first-order rate constants at constant temperature; and 3) the attainment of a reproducible spontaneous ignition temperature (SIT) during programmed heating at a linear rate. These observations indicate a considerable complexity in the surface structure of an activated carbon. GRA

N85-19040# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
GEL DRAWN FIBERS OF POLY(VINYL ALCOHOL)
Peggy Cebe and David T. Grubb 3 Jan. 1985 44 p
(Contract N00014-83-K-0471; NR Proj. 631-843)
(AD-A149062; TR-2) Avail: NTIS HC A03/MF A01 CSCL 11/9

Semi-crystalline gels of several samples of poly(vinyl alcohol) were made from solutions in which the polymer concentration varied from 2.0 to 15.0%. Entanglement density in the material was in this way reduced from the melt entanglement density. When gels were partially dried and drawn isothermally the maximum draw ratio increased with drawing temperature up to 11-14 at 140-180 C. A melt cast film could be drawn to 6.8 times at 140 C. Drawn material had a crystallinity of 55-80%, while that of isotropic material was 20-55%. Gels of lower initial concentration (lower entanglement density) could be drawn to greater extensions at a given draw temperature and had better mechanical properties. Young's modulus increased with draw ratio to values very close to those for polyethylene fibers drawn by the same amount. Young's modulus was independent of drawing temperature or degree of crystallinity but on comparing drawn gels of the same draw ratio, crystallinity and crystalline orientation, those of lower entanglement density had higher Youngs modulus. Author (GRA)

N85-19041# IBM Research Lab., San Jose, Calif.
PULSED PHOTOTHERMAL RADIOMETRY FOR REMOTE SENSING OF SPECTROSCOPIC AND PHYSICAL PROPERTIES OF THIN FILM
A. C. Tam 18 Dec. 1984 12 p
(Contract N00014-83-C-0170; NR Proj. 633-844)
(AD-A149080; TR-14) Avail: NTIS HC A02/MF A01 CSCL 14/2

Photothermal Radiometry (PTR) is a sensitive technique for noncontact spectroscopy and inspection; a modulated beam of photons (or other particles) is used to produce temperature transients, and the corresponding transients in the infrared thermal radiation emitted form the sample are analyzed. This paper describes the recent experimental and theoretical developments of pulsed PTR (PPTR) with back-scattering detection. PPTR is useful for many types of noncontact measurements, including absolute absorption spectroscopy, excitation spectroscopy, and the monitoring of thickness layered structure, thermal contacts, and associated properties. Further more, these measurements can be made on difficult samples like opaque materials, powders, aerosols, gels, skin in-vivo, and so on. GRA

N85-19042# Columbia Univ., New York. Dept. of Chemistry.
A METAL-CATALYZED REARRANGEMENT OF ALKENE-ALKYNES AND THE STEREOCHEMISTRY OF METALLACYCLOBUTENE RING OPENING
Thomas J. Katz and Timothy M. Sivavec 27 Dec. 1984 17 p
(Contract N00014-79-C-0683; NR Proj. 356-726)
(AD-A149084; TR-8) Avail: NTIS HC A02/MF A01 CSCL 07/4

A molecular rearrangement is described that demonstrates how alkyl-metal-carbenes are generated when metal derivatives combine with acetylenes and olefins and shows that tungsten-carbenes not stabilized by heteroatoms insert into acetylenes. It reveals that this insertion can be remarkably stereo-selective. With catalytic amounts of carbene-tungsten carbonyls, biphenyls substituted at the 2 and 2' positions by vinyl and acetylene groups yield isomeric 9-vinylphenanthrenes. With stoichiometric amounts, they yield 9-vinyl-phenanthrenes whose structures contain the carbene moiety of the metal-carbene. Author (GRA)

N85-19043# ECO Energy Conversion, Newton, Mass.
IMPROVED LITHIUM-INTERCALATION CATHODE MATERIAL Interim Progress Report, 1 Aug. - 31 Oct. 1984
1 Nov. 1984 3 p
(Contract N00014-84-C-0593)
(AD-A149319) Avail: NTIS HC A02/MF A01 CSCL 07/4

The objective of the program is to determine the lithiation capacity and reversibility of four classes of functionalized tetraazaannulenes (TAAs). GRA

N85-19044# Pennsylvania State Univ., University Park. Dept. of Chemistry.
CHARACTERIZATION OF CO BINDING SITES ON Rh(111) AND Rh(331) SURFACES BY XPS AND LEED (LOW ENERGY ELECTRON DIFFRACTION): COMPARISON TO EELS (ELECTRON ENERGY LOSS SPECTROSCOPY) RESULTS
L. A. DeLouise, E. J. White, and N. Winograd 1984 14 p Repr. from J. of Surface Sci., Amsterdam, v. 147, 1984 p 252-262
(Contract N00014-83-K-0052)
(AD-A149331; TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/4

Changes in the nature of the binding site of chemisorbed carbon monoxide on the Rhodium(111) and Rhodium(331) single crystal surfaces during absorption and desorption have been monitored by X-ray Photoelectron Spectroscopy (XPS) and Low Energy Electron Diffraction (LEED). Two bonding states of molecular carbon monoxide have been identified from the O 1s photoemmission line. These states are assigned as atop and bridge-bonded species and are observed to be coverage and temperature dependent. On both surfaces atop sites are populated first and at higher CO coverages bridge sites are filled. On Rh(111) the bridge sites are filled at a carbon monoxide coverage of theta co approx. 0.50 and their presence is correlated with a change in the LEED pattern. The presence of the step atoms on the Rh(331) surface markedly influenced the sequential filling of binding sites in comparison to that observed on the Rh(111) surface. A comparison of our data to previous Electron Energy Loss Spectroscopy (EELS) work on Rh(111) is in remarkable quantitative agreement with EELS peak heights. GRA

N85-19045# General Electric Co., Schenectady, N. Y.
A STUDY OF THE K-EDGE ABSORPTION SPECTRA OF SELECTED VANADIUM COMPOUNDS
J. Wong, F. W. Lytle (Boeing Co., Seattle, Wash.), R. P. Messmer, and D. H. Maylotte 15 Nov. 1984 55 p
(Contract N00014-83-C-0620)
(AD-A149334; TR-1) Avail: NTIS HC A04/MF A01 CSCL 07/4

High resolutions vanadium K-edge absorption spectra have been recorded for a number of selected vanadium compounds of known chemical structure using synchrotron radiation available at the Stanford Synchrotron Radiation Laboratory (SSRL). The compounds studied include oxides: VO, V2O3, V4O7, V2O4, and V2O5; vanadates: NH4VO3, CrVO4, and Pb5(VO4)3C1; vanadyl compounds: VOSO4-3H2O, vanadyl bis 1-phenyl 1,3-butane dionate, vanadyl phthalocyanine and vanadyl tetraphenylporphyrin; intermetallics: VH, VB2, VC, VN, VP, and VSi2; V2S3 and a vanadium-bearing mineral, roscoelite. Vanadium in these compounds exhibits a wide range of formal oxidation states (0 to +5) and coordination geometrics (octahedral, tetrahedral, square pyramid, etc.) with various ligands. The object of this systematic investigation is to gain further understanding of the details of various absorption features in the vicinity of the K absorption edge of a constituent element in terms of its valence, site symmetry, coordination geometry, ligand type, and bond distances. In particular the intensity and position of a well-defined pre-edge absorption in some of these compounds have been analyzed semi-quantitatively within a molecular orbital framework and a simple coordination charge concept. GRA

N85-19046# Auburn Univ., Ala. Dept. of Chemistry.
AN INFRARED STUDY OF ISOTOPIC EXCHANGE DURING

METHANATION OVER SUPPORTED RHODIUM CATALYSTS; AN INVERSE SPILLOVER EFFECT
M. A. Henderson and S. D. Worley 7 Jan. 1985 15 p
(Contract N00014-83-K-0637)
(AD-A149390; AD-F300533; TR-3) Avail: NTIS HC A02/MF A01 CSCL 18/2

Infrared spectroscopy has been employed to study the reduction of carbon dioxide on supported catalyst films. The investigation included isotopic labeling using deuterium as the reduction gas. Isotopic exchange was observed for both carbon dioxide/D2 and methane/deuterium mixtures. The mechanism of this isotopic exchange involves migration of hydrogen from the support to the rhodium sites, an inverse spillover effect. A key intermediate in the dissociation of carbon dioxide on the supported Rh films was a carbonyl hydride species. GRA

N85-19047# Georgia Univ., Athens. Dept. of Chemistry.
CHEMICAL APPLICATIONS OF TOPOLOGY AND GROUP THEORY. 18: POLYHEDRAL ISOMERIZATIONS OF SEVEN-COORDINATE COMPLEXES
R. B. King 2 Jan. 1985 18 p Prepared for publication
(Contract N00014-84-K-0365)
(AD-A149461; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

This paper presents all possible isomerizations involving the 34 combinatorially distinct seven-vertex polyhedra. Such isomerizations are expressed in the form P sub 1 yields P sub 2 yields P sub 3 in which P sub 1 and P sub 3 have the same number of edges and the intermediate polyhedron P sub 2 has fewer edges than P sub 1 or P sub 3. Isomerizations of this type are regarded as degenerate if P sub 1 is combinatorially equivalent to P sub 3 and planar if P sub 2 is a planar polygon. Non-planar isomerizations can be classified as n-pyramidal processes where n is the number of edges on the new face of P sub 2 generated by edge removal from P sub 1; 4-pyramidal processes also known as diamond-square-diamond processes are the most favorable energetically. GRA

N85-19048*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CARBON VAPORIZATION/CONDENSATION EFFECTS Final Report, Jun. 1979 - Sep. 1983
R. L. Baker, J. M. McDonough, K. C. Herr, R. A. Klingberg, J. C. Coffer, and M. A. Covington 31 Jul. 1984 81 p Prepared in cooperation with Aerospace Corp., El Segundo, Calif.
(Contract F04701-83-C-0084)
(NASA-TM-87430; NAS 1.15:87430; AD-A149475; TR-0084(9975)-3; SD-TR-84-53) Avail: NTIS HC A05/MF A01 CSCL 07D

The energy dissipating efficiency of carbon materials were studied. Equilibrium thermochemical properties and kinetic vaporization rate information have been obtained for temperatures approaching 4500K. A nonequilibrium ablation model and carbon laser vaporization experiments were used to determine the total vapor pressure, melt temperature limits, and the temperature dependence of carbon vaporization (rate) coefficients for different types of graphite. In addition, rough surface emissivities for these graphites were measured, and a preliminary study of the effects of carbon particles on infrared radiation transport in a laser-vaporized carbon plume was carried out. This information makes possible the reliable prediction of the performance of the carbon material thermal protection systems in extreme heat transfer environments. The measured vapor pressures are two to three times higher than those given by the current JANNAF tables, and the melt temperature limits are 300 to 600 K higher than current literature values. To our knowledge, our data represent the first reported temperature dependence of carbon vaporization coefficients. GRA

N85-19049# Auburn Univ., Ala. Dept. of Chemistry.
AN INFRARED STUDY OF THE HYDROGENATION OF CARBON DIOXIDE ON SUPPORTED RHODIUM CATALYSTS
M. A. Henderson and S. D. Worley 7 Jan. 1985 37 p
(Contract N00014-83-K-0637)
(AD-A149477; TR-4) Avail: NTIS HC A03/MF A01 CSCL 07/4

An infrared study of the methanation of CO2 on supported Rh catalysts has been performed. This reaction has been shown to occur over these catalysts with higher turnover frequency at a given temperature and Rh loading than does the methanation of CO. A support effect has been demonstrated for the reaction over the supported Rh catalysts (TiO2 Al2O3 SiO2 in reactivity). A key surface intermediate during the methanation reaction is a carbonyl hydride species, as evidenced by a prominent infrared band in the 2020 to 2040/cm region which shifts by 5 to 10/cm when D2 is substituted for H2 in the reaction mixture. This carbonyl hydride species can be produced in the absence of H2 by migration of H from the support to Rh. The dissociation of CO2 on supported Rh has been shown to be enhanced by the presence of H2 and impurity boron. GRA

N85-19050# Auburn Univ., Ala. Dept. of Chemistry.
AN INFRARED STUDY OF THE OXIDATION OF CARBON MONOXIDE OVER SUPPORTED RHODIUM CATALYSTS
C. H. Dai and S. D. Worley 7 Jan. 1985 19 p
(Contract N00014-83-K-0637)
(AD-A149478; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

The reaction of carbon monoxide and oxygen over supported rhodium films has been studied using infrared spectroscopy. The focus of work was the reactivity of the various CO/Rh/X (X=Al2O3, SiO2, TiO2) surface states for supported catalysts having high and low Rh loading. Under the reaction conditions the linear CO species was the most stable toward oxidation, but this could have been a result of an oxidized Rh surface. A new CO/Rh surface species has been proposed which exhibits an infrared band at 2000/cm for a 0.5% Rh/TiO2 film. This species is believed to be a bridged carbonyl between Rh+1 and the TiO2 support. GRA

N85-19051# Emory Univ., Atlanta, Ga. Dept. of Chemistry.
PREDICTION OF RETENTION INDICES OF POLYNUCLEAR AROMATIC HYDROCARBONS. PART 1: HPLC ON NITROGEN CONTAINING NORMAL PHASE PACKING MATERIALS
Daniel Karlesky, Isiah M. Warner, Chu Ngi Ho, and John R. Kennedy 1984 29 p refs
(Contract DE-AS05-82ER-60100)
(DE85-001302; DOE/ER-60100/4) Avail: NTIS HC A03/MF A01

A method for predicting retention indices of polynuclear aromatic hydrocarbons (PAH) in high pressure liquid chromatographic separation is presented. The method is based on trigonal additivity as a means to quantitatively assign a value for the structural, and more importantly, electronic properties of a PAH, and to correlate these values with their retention indices on nitrogen containing bonded phases. Trigonal additivity takes into consideration all of the major electronic interactions in the molecule. Since it has been applied with success for correlating thermodynamic properties of molecules, it should be an appropriate parameter for correlation of retention data in chromatography. Findings are compared using trigonal additivity with that of the well known molecular connectivity index of Randic, and explanations for the observed correlations are proposed. DOE

N85-19052# Emory Univ., Atlanta, Ga. Dept. of Chemistry.
DESORPTION EFFICIENCES OF VAPOR PHASE POLYNUCLEAR AROMATIC COMPOUNDS ON SOLID ADSORBENTS
Karen D. Timmons, Cori Karlesky, Erica Johnson, and Isiah M. Warner 1984 27 p refs
(Contract DE-AS05-83ER-60100)
(DE85-001303; DOE/ER-60100/3) Avail: NTIS HC A03/MF A01

Polynuclear aromatic compounds (PNAs) in the vapor phase can be collected by adsorption onto solid adsorbents. The results of a study using several liquid and gas chromatographic packing materials to determine their applicability for vapor phase sampling of PHAs are reported. The desorption procedure for PNAs from the solid adsorbents involves extraction with nonpolar organic solvents. The desorption efficiency for each adsorbent was evaluated using gas chromatography. The combined adsorption/desorption (recovery) efficiency of several adsorbents was investigated. These adsorbents can be grouped into four classifica-

tions: (1) carbon or charcoal; (2) macroreticular resins such as Tenax GC or the XAD series; (3) adsorbents solids such as silica, alumina, and Florisil; and (4) bonded phases on silica such as C18. The resin XAD-8 was found to be most suitable for sampling vapor phase PNAs as a result of its high adsorption desorption efficiency and good reproducibility. DOE

N85-19053# Emory Univ., Atlanta, Ga. Dept. of Chemistry.
PREDICTION OF RETENTION INDICES OF POLYNUCLEAR AROMATIC HYDROCARBONS. PART 2: CAPILLARY GAS CHROMATOGRAPHY
Chu Ngi Ho (East Tennessee State Univ., Johnson City), John R. Kennedy (Texas A&M Univ., College Station), G. R. Samyajulu (Texas A&M Univ., College Station), Doris Karlesky, and Isiah M. Warner 1984 13 p refs
(Contract DE-AS05-82ER-60100)
(DE85-001301; DOE/ER-60100/5) Avail: NTIS HC A02/MF A01

A trigonal additivity procedure was examined and found to correlate well with retention indices for polynuclear aromatic hydrocarbons (PAH) on several gas chromatographic stationary phases. The results are compared to those obtained from the Randic (connectivity) index. It is shown that trigonal additivity is a viable approach to correlating retention of PAH's on gas chromatographic columns. DOE

N85-19054*# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
ELECTROCATALYSIS RESEARCH Final Report, 25 Aug. 1982 - 30 Dec. 1983
L. F. Warren Aug. 1984 33 p refs
(Contracts JPL-956343; DE-AI01-81CS-66001)
(NASA-CR-174352; JPL-9950-926; NAS 1.26:174352; DE85-000324; DOE/CS-66001/7; SC5343.28FR) Avail: NTIS HC A03/MF A01 CSCL 07D

Electrocatalysis is accessed and research areas and approaches most likely to lead to substantial energy/cost savings are identified. The overall approach was to compile and evaluate available information. Some promising approaches identified include the use of transition metal compounds as electrocatalysts and the use of the new electrochemical photocapacitance spectroscopy (EPS) technique for electrocatalysts characterization/development. An oxygen electrocatalyst based on the K2NiF4 structure was synthesized, investigated and compared with a perovskite analog. It is shown that this class of materials, based on Ni(3+), forms very efficient and stable O2 anodes in basic solution. The problem of dinitrogen and carbon dioxide electroreductions is addressed through the use of biological model systems. The electrolytic reduction of N2 and CO2 may prove to be of great importance for manned space vehicle applications. The approach was to apply to the electrode surface model systems which complex N2 and/or CO2; these are reduced in an aqueous or protic environment to generate N2H4, NH3, CH3OH. Transition metal phosphine complexes were chosen as the models. DOE

N85-19055# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
HYDROGEN FROM SOLAR ENERGY
R. G. Nix Jul. 1984 10 p refs Presented at the 1st IEA Hydrogen Annex Workshop, Toronto, 12 Jul. 1984
(Contract DE-AC02-83CH-10093)
(DE85-001914; SERI/TP-251-2424; CONF-840797-1) Avail: NTIS HC A02/MF A01

This paper describes those portions of the Photo/Thermochemical Research Program that possibly apply to the production of hydrogen from sources such as water or hydrogen sulfide. That research centers around understanding high flux solids decomposition reactions and how to best exploit photoreactions so the energy contained in the entire solar spectrum is used. DOE

N85-19056# Edgerton, Germeshausen and Grier, Inc., Goleta, Calif. Energy Measurements Group.
MERCURIC IODIDE PHOTODETECTORS FOR SCINTILLATION SPECTROSCOPY
J. Markakis, C. Ortale, W. Schnepple, J. Iwanczyk (Univ. of Southern Calif., Marina Del Rey), and A. Dabrowski (Univ. of Southern Calif., Marina Del Rey) 1984 4 p refs Presented at the Nucl. Sci. Symp., Orlando, Fla., 31 Oct. - 2 Nov. 1984
(Contract DE-AC02-83NV-10282)
(DE85-001437; DOE/NV-10282/2038; CONF-841007-6) Avail: NTIS HC A02/MF A01

The responses to Cs-137 (662 keV) were measured for both a 1-inch-diam by 2-inch-thick NaI(Tl) scintillator optically coupled to a 1-inch-diam by 800-micron-thick mercuric iodide (HgI2) photodetector, and a 1-cm-diam by 1-cm-thick CaWO4 scintillator coupled to a 1.3-cm-diam by 600-micron-thick HgI2 photodetector. Best spectral resolution to Cs-137 was 7.8% FWHM for the NaI(Tl)-HgI2 and 12.5% FWHM for the CaWO4-HgI2 detectors; peak-to-valley ratios were 26:1 and 16:1, respectively. HgI2 detectors operate at room temperature and their use in scintillation spectroscopy presents the ultimate miniaturization of scintillation detectors, limited mainly by the size of the scintillation crystal. DOE

N85-19057# California Univ., Los Angeles.
CONTINUOUS ORGANIC ELECTROCHEMICAL SYNTHESIS Final Report
K. Nobe, M. Baizer, P. Pintauro, K. Park, and S. Gilbert Jul. 1984 95 p refs Prepared for California Univ. Lawrence Berkeley Lab.
(Contract DE-AC03-76SF-00098)
(DE85-001400; LBL-18133) Avail: NTIS HC A05/MF A01

The electrochemical oxidation of glucose to gluconic acid and reduction of glucose to sorbitol has been successfully paired in an undivided packed bed electrode flow cell. The use of a Raney nickel powder catalytic cathode significantly improved the current efficiency for sorbitol production, as compared to a high hyrogen overpotential Zn(Hg) cathode. The optimum operating conditions for the paired synthesis are: activity W-2 Raney nickel powder cathode, graphite chip anode, a 1.6 M glucose and 0.4 M CaBr2 initial solution composition, pH 6-7, 60 C solution temperature, a current density of 250 to 500 mA and a solution volumetric flow rate of 100 ml min(-1). Under these conditions the sorbitol current efficiencies are at least 80%, the glucose acid current efficiencies are 100% and the product yields are quantitative. A separation scheme for the paired synthesis has also been deviced. It consists of the precipitation of the oxidation product (calcium gluconate) and the ethanol extraction of glucose and CaBr2 from sorbitol. Based on a preliminary economic analysis of the cost of raw materials, energy and the electrochemical cell and separation equipment the cost of producing 1 lb calcium gluconate and 0.68 lb sorbitol in a paired synthesis was estimated to be $0.896. DOE

N85-19058# Princeton Univ., N. J. Dept. of Statistics.
DATA-DRIVEN CHOICE OF A SPECTRUM ESTIMATE: EXTENDING THE APPLICABILITY OF CROSS-VALIDATION METHODS
C. M. Hurvich Jul. 1984 8 p
(Contract DE-AC02-81ER-10841)
(DE85-001411; DOE/ER-10841/12) Avail: NTIS HC A02/MF A01

The objective choice of a spectrum estimate from a class C of possible estimates is examined. A method of doing this for univariate stochastic processes is presented when the members of C are functions of the estimated covariance sequence. Thus, C can simultaneously include Blackman-Tukey and autoregressive spectrum estimates, among others. The essence of the method is to use any of the existing cross-validation technique in conjunction with a new and generally applicable definition, which we will propose, for the leave-out-one version of a spectrum estimate. DOE

N85-19059# Argonne National Lab., Ill.
PCB ANALYSIS BY CAPILLARY GAS CHROMATOGRAPHY COUPLED WITH MATRIX ISOLATION-FOURIER TRANSFORM INFRARED SPECTROSCOPY
J. F. Schneider and G. T. Reedy 1984 10 p refs Presented at

the Intern. Chem. Congr. of Pacific Basin Societies, Honolulu, Hawaii, 16 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-009201; CONF-841210-1) Avail: NTIS HC A02/MF A01

The high resolution possible with capillary gas chromatography, coupled with the superior infrared spectra produced by matrix isolation FTIR, yields a powerful analytical tool, which is used here for the analysis of polychlorinated biphenyls (PCBs). Individual PCB isomers are identified in Aroclor mixtures using the maxtrix isolation infrared spectra of PCBs are presented. The Gas Chromatograph-Matrix Isolation-Fourier Transform Infrared (GC-MI-FTIR) instrument is described. The GC-MI-FTIR is especially useful in the determination of PCBs in samples where the Aroclor pattern is not presented. DOE

N85-19060# Mound Lab., Miamisburg, Ohio.
INFRARED THERMOGRAPHY OF BURN FRONT PROPAGATION IN HEAT POWDERS
M. D. Kelly and L. D. Abney 1984 5 p Presented at the 7th Intern. Soc. for Opt. Eng. Meeting on Thermosense, Cambridge, Mass., 5 Nov. 1984
(Contract DE-AC04-76DP-00053)
(DE85-003307; MLM-3216(OP); CONF-8411120-2) Avail: NTIS HC A02/MF A01

Heat powders are consolidated into dense composites to form concentrated chemical heat sources. During the reaction, a high temperature burn front propagates through the composites. The burn front is preceded by a lower temperature thermal front which generates thermal gradients. Thermography was used to determine thermal gradients preceding the burn front, during the reaction of the consolidated heat powder. The techniques involved along with the resulting thermography are discussed. DOE

N85-19061# Mound Lab., Miamisburg, Ohio.
THERMAL PROFILES OF THERMITE REACTIONS
M. D. Kelly and L. D. Abney 1984 3 p Presented at the 7th Intern. Soc. for Opt. Eng. Meeting on Thermosense, Cambridge, Mass., 5 Nov. 1984
(Contract DE-AC04-76DP-00053)
(DE85-003308; MLM-3215(OP); CONF-8411120-3) Avail: NTIS HC A02/MF A01

Thermite is a mixture of a metal and oxide which is consolidated to form a composite chemical heat source. Thermal profiles of reacting thermite composites were generated and analyzed to determine the burn rate and the heat propagation during and after the reaction. These thermal profiles are used to establish rates of heat transfer. A time-expanded infrared thermography video is used to show burn rate, heat propagation, and burn uniformity of consolidated thermite during reaction. DOE

N85-19062# Pacific Northwest Lab., Richland, Wash.
SEPARATION OF GAS MIXTURES WITH COORDINATION COMPLEXES
D. A. Nelson, T. Hallen, M. A. Lilga, C. L. Lee, and B. R. Janes Feb. 1984 13 p refs
(Contract DE-AC06-76RL-01830)
(DE85-000363; PNL-SA-12032) Avail: NTIS HC A02/MF A01

Several coordination complexes were examined for their ability to sorb CO2, CO, or H2 reversibly. Three of those complexes appeared worthy of further investigation. Carbon dioxide was rapidly bound by crystalline Ir(dmpe)2Cl within 10 seconds. Desorption of CO2 was achieved with heat and decreased pressure. The series Pd2(dmp)2X2, where X = Cl, Br, 1, and NCO, was found to be of considerable interest for CO sorption. Sorption of CO was rapid and the kinetics appeared to be quite favorable. The kinetics were not influenced by the presence of CO2, N2, O2, H2, ethylene or acetylene. Thus, Pd2(dmp)2X2 showed considerable specificity for CO. Hydrogen, oxygen, and carbon monoxide were sorbed by Ru(CO)2(PPh3)3; however, the complex required that a phosphine ligand be released prior to gas coordination. The kinetics of these reactions indicated that H2 was bound twice as fast as CO and seven times faster than O2. DOE

N85-19063# State Univ. of New York, Geneseo.
SYNCHROTRON X-RAY FLUORESCENCE AND EXTENDED X-RAY ABSORPTION FINE STRUCTURE ANALYSIS
J. R. Chen, B. M. Gordon (Brookhaven National Lab.), A. L. Hanson (Brookhaven National Lab.), K. W. Jones (Brookhaven National Lab.), H. W. Kraner (Brookhaven National Lab.), E. C. T. Chao (Geological Survey, Reston, Va.), and J. A. Minkin (Geological Survey, Reston, Va.) 1985 22 p refs Presented at the Scanning Electron Microscopy Conf., Philadelphia, 15 Apr. 1984
(Contract DE-AC02-76CH-00016)
(DE85-003606; BNL-35338; CONF-8404131-2) Avail: NTIS HC A02/MF A01

The advent of dedicated synchrotron radiation sources has led to a significant increase in activity in many areas of science dealing with the interaction of X-rays with matter. Synchrotron radiation provides intense, linearly polarized, naturally collimated, continuously tunable photon beams, which are used to determine not only the elemental composition of a complex, polyatomic, dilute material but also the chemical form of the elements with improved accuracy. Examples of the application of synchrotron radiation include experiments in synchrotron X-ray fluorescence (SXRF) analysis and extended X-ray absorption fine structure (EXAFS) analysis. New synchrotron radiation X-ray microprobes for elemental analysis in the parts per billion range are under construction at several laboratories. DOE

N85-19064# Pacific Northwest Lab., Richland, Wash.
CAPABILITIES OF LASER DIAGNOSTICS FOR COMBUSTION AND FLOW FIELDS
R. A. Hutchinson and H. J. Bomelburg Nov. 1984 90 p refs
(Contract DE-AC06-76RL-01830)
(DE85-002661; PNL-5280) Avail: NTIS HC A05/MF A01

The capabilities and some of the complications of several laser diagnostic techniques that utilize a variety of optical phenomena are outlined. These techniques are potentially applicable to a wide variety of in-situ measurements. Considerable emphasis is placed on general concerns in choosing and using a diagnostic and on outlining the limitations of specific diagnostics. These factors, and the decisions and compromises they force, are critical elements in the selection of what to measure and the best tool with which to measure it. They are not generally reported in broad terms in the literature, however. Lasers, data acquisition and reduction requirements, generic sources of error, and the difficulties of making good measurements are discussed along with the required conditions and difficulties of using particular tools. R.S.F.

N85-19065# United Technologies Research Center, East Hartford, Conn.
MECHANISMS AND REACTION DYNAMICS RELATED TO METHANE COMBUSTION Final Report, Apr. 1982 - Jun. 1984
M. F. Zabielski 29 Jun. 1984 88 p refs Sponsored by Gas Research Inst.
(PB85-129690; UTRC/R84-956114-24; GRI-84/0126) Avail: NTIS HC A05/MF A01 CSCL 21B

The purpose of this research is to obtain fundamental information on processes occurring at the onset of ignition in methane flames and the mechanisms involved in the formation of prompt nitric oxide. The temperature profiles were determined in each of the flames with the thermocouple probing, sodium line reversal, OH rotational spectrometry, and partial equilibrium calculations. Detailed measurements of major and minor species were made with molecular beam mass spectrometry and resonance absorption spectrometry. The net reaction rates of all species were calculated with corrections for diffusion. Model calculations were made and compared with experimental results. GRA

N85-19066# National Oceanic and Atmospheric Administration, Boulder, Colo. National Engineering Lab.
LASER-INTIATED COMBUSTION STUDIES ON METALLIC ALLOYS IN PRESSURIZED OXYGEN
J. W. Bransford Aug. 1984 74 p refs
(PB85-128114; NBSIR-84/3013) Avail: NTIS HC A04/MF A01 CSCL 21B

The interim results of ignition and combustion studies on aluminum, cobalt, iron, and nickel based alloys are presented. It was found that aluminum alloys could be ignited below the melting point of the product alloy oxides. It was also found that the cobalt, iron, and nickel based alloys generally ignited slightly below to slightly above the melting range of the respective alloy. Unsupported combustion could not be achieved until the alloys and oxides were in the liquid state. Author (GRA)

N85-19067# Bureau of Mines, Pittsburgh, Pa.
THEORY OF FLAMMABILITY LIMITS. FLOW GRADIENT EFFECTS AND FLAME STRETCH
M. Hertzberg 1984 43 p refs
(PB85-135077; BM-RI-8865; LC-83-600372) Avail: NTIS HC A03/MF A01 CSCL 21B

In this Bureau of Mines study, an equation is derived for the limit burning velocity for divergent, spherical propagation from an ignition kernel. These formulations are shown to be equivalent to the fluid dynamic concepts of Damkohler, Karlovitz, and Markstein. Existing data for the blowoff limits of flames are shown to give excellent agreement with those concepts provided that proper account is taken of two dilution effects: composition dilution caused by entrainment and velocity gradient dilution caused by flow expansion. Approximate flow-field solutions are also derived for the unburned gas motion above an upward propagating, spherical flame kernel in buoyancy-induced flows. It is shown that the upward hemisphere propagates toward a stagnation plane in a counterflow configuration involving the balance between the combustion force, which accelerates the cold gas upward, and the buoyancy force that accelerates the cold gas downward. Author (GRA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-19068# British Library Lending Div., Boston Spa (England).
DEFECTIVE NATURE OF THE CRYSTALLINE LATTICE OF NICKEL FERRITE-BASED SOLID SOLUTIONS
V. I. Arkharov, V. N. Bososlovskii, V. P. Paschenko, E. E. Solovef, and A. A. Shenyakov 17 Jan. 1985 4 p Transl. into ENGLISH from Strukt. Svoistva Ferritov (USSR), v. 74 p 69-72
(BLL-Trans-WH-595-(9091.9F)) Avail: British Library Lending Div., Boston Spa, England

The defects in the crystalline lattice of nickel ferrite-based solid solutions formed within the limits of single-phase specimens were studied. The experimental material used was a mixture of NiO and alpha-Fe2O3 in a non-equimolar ration with excess alpha-Fe2O3. Preliminary ferritization was carried out in air for 3 h at 1173 K. Specimens were compressed and annealed for 4 h at 1473 K in atmospheres with different partial oxygen pressures. Oxygen, air, carbon dioxide, a carbon dioxide/carbon monoxide mixture and argon were used as experimental atmospheres. Radiological and microscopic examination showed all the specimens to contain only the spinel phase, irrespective of the annealing atmosphere. It is concluded that ferrite of the indicated composition contains defects in both the cationic and anionic sublattices which are manifested in cluster form. A.S.B.

N85-19069*# National Aeronautics and Space Administration, Washington, D. C.
PRODUCTION METHOD OF NICKEL ELECTRODE
H. Ikeda and T. Ohira Dec. 1982 7 p Transl. into ENGLISH of Japanese Patent no. 55-32193 (17 Apr. 1975) Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76946; NAS 1.15:76946) Copyright. Avail: NTIS HC A02/MF A01 CSCL 11F

A nickel electrode having improved charging efficiency, an increased coefficient of discharging utilization, and large capacity is disclosed. Nickel hydroxide or nickel oxide is retained in a porous nickel substrate which is immersed in an aqueous solution of cobalt acetate with a pH 4.0 to 6.8. The electrode thus obtained is then immersed in an alkaline solution or heated to change cobalt acetate into cobalt hydroxide or cobalt oxide whereby the surface of nickel active material is covered with cobalt crystals and alloying of cobalt and nickel is promoted at the same time. A.R.H.

N85-19070*# National Aeronautics and Space Administration, Washington, D. C.
INITIAL AGING PHENOMENA IN COPPER-CHROMIUM ALLOYS
H. Suzuki and K. Motohiro Jan. 1985 20 p refs Transl. into ENGLISH from Nippon Kinzoku Gakkaishi (Japan), v. 37, no. 1, 1973 p 13-18 Transl. by The Corporate Word, Inc., Pittsburgh, Pa.
(Contract NASw-4006)
(NASA-TM-77790; NAS 1.15:77790) Avail: NTIS HC A02/MF A01 CSCL 11F

The effects of quenching and aging temperatures on the initial aging curves of Cu-Cr alloy were examined mainly by means of electrical resistivity measurements. Three Cu-Cr alloy specimens having 0.24, 0.74, and 1.0% Cr were solution-treated at 950-1050 C, quenched into ice-water, and subsequently aged at 300-500 C. The results were as follows: (1) At the very early stage of aging (within about 30 sec), an abrupt decrease of resistivity with lowering aging tempratures. (T sub A) and rising solution temperatures (T sub S) was observed at (T sub A) up to about 400 C. In contrast, a transient increase of resistivity with rising T sub A and lowering T sub S was observed at T sub A from about 450 to 500 C. These phenomena seem to be caused by a rapid formation of solute clusters and the reversion of clusters formed during quenching, which are enhanced by quenched-in vacancies, respectively. (2) The amount of precipitation increased at the latter stage of aging with rising T sub S and T sub A as generally expected, where T sub S was not so high as to form secondary defects. (3) As a result, the initial aging phenomena in Cr-Cr alloy were revealed to be complicated against expectations. This was considered to be due to the migration energy of vacancies so larger in Cu-base. Author

N85-19071*# National Aeronautics and Space Administration, Washington, D. C.
BONDABILITY OF Al-Si THIN FILM IN THERMOSONIC GOLD WIRE BONDING
Koichi Nakagawa, Kazuaki Miyata, Torhinobu Banjo, and Wataru Shimada Jan. 1985 15 p refs Transl. into ENGLISH from Koon Gakkaishi (Japan), v. 4, no. 4, 1978 p 173-180 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77795; NAS 1.15:77795) Avail: NTIS HC A02/MF A01 CSCL 11F

The bondability of two kinds of Al-Si thin films in thermosonic Au wire bonding was examined by means of microshear tests. One type of film was formed by sputtering an Al-2% Si alloy, and the other was formed by depositing an 0.05 micrometer-thick polysilicon layer on SiO2 by chemical vapor deposition (CVD) and then depositing a 1.2 micrometer-thick Al layer on them by evaporation. After heat-treatment at 450 deg for 30 min., Si in the Al-Si film crystallized. The grain size of the crystallized Si affects the thermosonic wire bondability, i.e., for Al-2% Si sputtered films, good bondability was obtained under relatively small (1.0 micrometer) grain size conditions. In the successive layer process, on the other hand, the grain size of crystallized Si varies with the polysilicon CVD temperature. The optimum CVD temp. was determined from the standpoint of bondability with respect to grain size. Author

N85-19072*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH TEMPERATURE PROPERTIES OF EQUIATOMIC FeAl WITH TERNARY ADDITIONS
R. H. Titran, K. M. Vedula (Case Western Reserve Univ.), and G. G. Anderson (Case Western Reserve Univ.) 1984 14 p refs Presented at the Fall Meeting of the Mater. Res. Soc., Boston,

26-30 Nov. 1984
(NASA-TM-86938; E-2452; NAS 1.15:86938) Avail: NTIS HC A02/MF A01 CSCL 11F

The aluminide intermetallic compounds are considered potential structural materials for aerospace applications. The B2 binary aluminide FeAl has a melting point in excess of 1500 K, is of simple cubic structure, exits over a wide range of composition with solubility for third elements and is potentially self-protecting in extreme environments. The B2 FeAl compound has been alloyed with 1 to 5 at % ternary additions of Si, Ti, Zr, Hf, Cr, Ni, Co, Nb, Ta, Mo, W, and Re. The alloys were prepared by blending a third elemental powder with prealloyed binary FeAl powder. Consolidation was by hot extrusion at 1250 K. Annealing studies on the extruded rods showed that the third element addition can be classified into three categories based upon the amount of homogenization and the extent of solid solutioning. Constant strain rate compression tests were performed to determine the flow stress as a function of temperature and composition. The mechanical strength behavior was dependent upon the third element homogenization classification. Author

N85-19073*# Michigan Technological Univ., Houghton.
EFFECTS OF MAR-M247 SUBSTRATE (MODIFIED) COMPOSITION ON COATING OXIDATION COATING/SUBSTRATE INTERDIFFUSION M.S. Thesis. Final Report
Brian H. Pilsner Feb. 1985 126 p refs
(Grant NAG3-216)
(NASA-CR-174851; NAS 1.26:174851) Avail: NTIS HC A07/MF A01 CSCL 11F

The effects of gamma+gamma' Mar-M247 substrate composition on gamma+beta Ni-Cr-Al-Zr coating oxidation and coating/substrate interdiffusion were evaluated. These results were also compared to a prior study for a Ni-Cr-Al-Zr coated gamma Ni-Cr-Al substrate with equivalent Al and Cr atomic percentages. Cyclic oxidation behavior at 1130 C was investigated using change in weight curves. Concentration/distance profiles were measured for Al, Cr, Co, W, and Ta. The surface oxides were examined by X-ray diffraction and scanning electron microscopy. The results indicate that variations of Ta and C concentrations in the substrate do not affect oxidation resistance, while additions of grain boundary strengthening elements (Zr, Hf, B) increase oxidation resistance. In addition, the results indicate that oxidation phenomena in gamma+beta/gamma+gamma' Mar-M247 systems have similar characteristics to the I gamma+beta/gamma Ni-Cr-Al system. Author

N85-19074*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW CYCLE FATIGUE OF MAR-M 200 SINGLE CRYSTALS AT 760 AND 870 DEG C
Walter W. Milligan (Georgia Inst. of Tech., Atlanta), N. Jayaraman (Cincinnati Univ.), and Robert C. Bill 1984 31 p refs Presented at the TMS-AIME Fall Meeting, Detroit, 17-19 Sep. 1984 Prepared in cooperation with Army Research and Technology Labs., Cleveland
(DA Proj. 1L1-61101-AH-45)
(NASA-TM-86933; E-2444; NAS 1.15:86933; USAAVSCOM-TR-85-C-1) Avail: NTIS HC A03/MF A01 CSCL 11F

Fully reversed low cycle fatigue tests were conducted on single crystals of the nickel-base superalloys Mar-M 200 at 760 C and 870 C. At 760 C, planar slip (octahedral) lead to orientation-dependent strain hardening and cyclic lives. Multiple slip crystals strain hardened the most, resulting in relatively high stress ranges and low lives. Single slip crystals strain hardened the least, resulting in relatively low stress ranges and higher lives. A preferential crack initiation site which was related to slip plane geometry was observed in single slip orientated crystals. At 870 C, the trends were quite different, and the slip character was much more homogeneous. As the tensile axis orientation deviated from $< 001 >$, the stress ranges increased and the cyclic lives decreased. Two possible mechanisms were proposed to explain the behavior: one is based on Takeuchi and Kuramoto's cube cross-slip model, and the other is based on orientation-dependent creep rates. E.A.K.

N85-19075*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHARACTERIZATION OF EROSION OF METALLIC MATERIALS UNDER CAVITATION ATTACK IN A MINERAL OIL
Bezzam C. S. Rao (Case Western Reserve Univ.) and Donald H. Buckley 1985 24 p refs Proposed for presentation at the Tribology Conf., Atlanta, 8-10 Oct. 1985; sponsored by the American Society of Lubrication Engineers and the American Society of Mechanical Engineers
(NASA-TM-86934; E-2049-1; NAS 1.15:86934) Avail: NTIS HC A02/MF A01 CSCL 11F

Cavitation erosion and erosion rates of eight metallic materials representing three crystal structures were studied. The erosion experiments were conducted with a 20-kHz ultrasonic magnetostrictive oscillator in a viscous mineral oil. The erosion rates of the metals with an fcc matrix were 10 to 100 times higher than that of an hop-matrix titanium alloy. The erosion rates of iron and molybdenum, with bcc matrices, were higher than that of the titanium alloy but lower than those of those of the fcc materials. Studies with scanning electron microscopy indicated that the cavitation pits were initially formed at the grain boundaries and precipitates and that the pits formed at the junction of grain boundaries grew faster than the others. Transcrystalline craters formed by cavitation attack over the surface of grains and roughened the surfaces by multiple slip and twinning. Surface roughness measurements showed that the pits that formed over the grain boundaries deepened faster than pits. Computer analysis revealed that a geometric expression describes the nondimensional erosion curves during the time period 0.5 t (sub 0) $<$ t $<$ 2.5 t (sub 0), where t (sub 0) is the incubation period. The fcc metals had very short incubation periods; the titanium alloy had the longest incubation period. Author

N85-19076*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE B2 ALUMINIDES AS ALTERNATIVE MATERIALS
Joseph R. Stephens 1984 26 p refs Presented at the Fall Meeting of the Mater. Res. Soc., Boston, 26-30 Nov. 1984
(NASA-TM-86937; E-2451; NAS 1.15:86937) Avail: NTIS HC A03/MF A01 CSCL 11F

The potential of the B2 aluminides as structural material alternatives for the strategic element containing superalloys currently used in gas turbine engines is being explored with emphasis on the equiatomic Fe and Ni aluminides. Although Co is a strategic material, the equiatomic Co aluminide is also being studied to gain a more complete understanding of these fourth period intermetallics. Research focuses on initial processing techniques such as ingot melting, power metallurgy, and rapid solidification with and without additional thermomechanical processing; high temperature deformation - primarily compressive creep; compositional effects within the binary B2 aluminides; third-element alloying addition effects on high temperature strength and oxidation resistance, and near room temperature ductility as influenced by processing, alloying, and grain size. Various programs now underway are reviewed and some highlights of research results are presented. A.R.H.

N85-19077*# National Aeronautics and Space Administration, Washington, D. C.
METHOD OF PRODUCING NICKEL ELECTRODE
Yutaka Ikeda, Tsukasa Ohira, Yasuyuki Kumano, and Toshio Nakao Aug. 1982 7 p Transl. into ENGLISH of Japanese Patent no. 55-32192 (17 Apr. 1975) Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76944; NAS 1.15:76944) Avail: NTIS HC A02/MF A01 CSCL 09A

A large capacity nickel electrode is provided in which the charging efficiency and discharge utilization coefficient are improved in comparison to nickel electrodes which are produced

by the conventional method. Nickel electrodes retaining nickel active material or nickel active material and cobalt compounds on a porous nickel substrate are immersed in a cobalt sulfate aqueous solution whose pH is adjusted in the range of 3.5 to 6.0, followed by crystallization of the hydroxide or oxide by pyrolysis or immersion in alkali, thereby coating the surface of the nickel active material with cobalt crystals and simultaneously promoting alloying of the nickel-cobalt. Author

N85-19078*# IIT Research Inst., Chicago, Ill.
CREEP-RUPTURE BEHAVIOR OF IRON SUPERALLOYS IN HIGH-PRESSURE HYDROGEN Quarterly Narrative Report, 7 Dec. 1982 - 28 Feb. 1983
S. Bhattacharyya and W. Peterman Jun. 1984 44 p
(Contract DEN3-303)
(NASA-CR-174411; NAS 1.26:174411; IITRI-M06116-3; QNR-1) Avail: NTIS HC A03/MF A01 CSCL 11F

The creep-rupture properties of five iron-base and one cobalt-base high temperature alloys were investigated to assess the feasibility of using the alloys as construction materials in a Stirling engine. The alloys were heat treated and hardness measurements were taken. Typical microstructures of the alloys are shown. The creep-rupture properties of the alloys were determined at 760 and 815 C in 15.0 MPa H2 for 200 to 1000 hours. Plots of rupture life versus stress for the six superalloys are presented along with creep strain-time plots. R.S.F.

N85-19079# Colt Industries, Inc., Pittsburgh, Pa.
COBALT-FREE PERMANENT MAGNET ALLOYS Final Report, Oct. 1981 - Dec. 1983
K. S. V. L. Narasimhan, B. M. Ma, and T. Lizzi Oct. 1984 69 p
(Contract N00014-81-C-0805)
(AD-A149272) Avail: NTIS HC A04/MF A01 CSCL 11/6

We have undertaken the study of cobalt-free alloys for evaluation of their use in permanent magnet fabrication. A two-phase study was carried out. In the first phase, the plasma arc process was employed for the production of fine powder of MnAlC and the second phase was confined mainly with melt spinning. Both of these rapid solidification technology approaches should permit stabilization of metastable phases and offer a unique technique of generating coercivity. The results of our investigation indicate that melt spinning of boron containing Nd-Fe and Pr-Fe alloys can provide high values of coercive force and saturation magnetization. The composition of the magnetic phase responsible for the high coercive force was identified to be R3Fe20B. GRA

N85-19080# Johns Hopkins Univ., Baltimore, Md. Center for Materials Research.
RESEARCH ON RAPIDLY SOLIDIFIED ALLOYS Progress Report, 1 Nov. 1983 - 1 Nov. 1984
D. Shechtman and L. A. Bendersky Nov. 1984 94 p
(Contract MDA903-83-K-0400)
(AD-A149380; AD-F300533; CMR-DARPA-9) Avail: NTIS HC A05/MF A01 CSCL 11/6

The report describes the study of rapidly solidified alloys including methods of preparation, processing and characterization using a variety of techniques such as TEM, analytical electron microscopy, and X-ray diffraction. The following topics are discussed: (1) rapid solidification microstructures and precipitates in aluminum magesium alloys; (2) microstructure of supercooled submicrometer aluminum cooper alloy powder; (3) the effect of rapid solidification velocity on microstructure and phase solubility extension in nickel aluminum/chromium quasibinary eutectic; (4) cellular microsegregation in rapidly solidified silver-15 wt% copper alloys; (5) orientation relationship between precipitated Al9(Fe,Ni)2 phase and alpha-aluminum; and (6) the structure and decomposition behavior of rapidly solidified aluminum chromium alloys. GRA

N85-19081# Wayne State Univ., Detroit, Mich.
SCANNING PHOTOACOUSTIC MICROSCOPY OF ALUMINUM WITH ALUMINUM OXIDE, ROUGHNESS STANDARDS AND RUBBER Interim Report, Jun. 1982 - Jun. 1984
R. L. Thomas, L. D. Favro, P. K. Kuo, D. N. Rose (Army Tank-Automotive Command, Warren, Mich.), D. Bryk (Army Tank-Automotive Command, Warren, Mich.), M. Chaika (Army Tank-Automotive Command, Warren, Mich.), and J. Patt (Army Tank-Automotive Command, Warren, Mich.) Jun. 1984 53 p
(Contract DAAE07-81-C-4049)
(AD-A149460; TACOM-TR-12957) Avail: NTIS HC A04/MF A01 CSCL 11/6

Thermal wave imaging of coated samples, surface geometries of homogeneous samples, and dispersed particles in rubber samples are presented and discussed. Preliminary results of color-encoding of images are encouraging. Further photothermal (infrared radiation) detection studies of the coated graphite samples are recommended, along with more detailed study of numerical analysis of surface roughness applications. Preparation of rubber samples containing layer defects is also recommended. GRA

N85-19082# Argonne National Lab., Ill. Materials Science and Technology Div.
RADIATION-INDUCED COMPOSITIONAL REDISTRIBUTION AND LOCAL PHASE TRANSFORMATION IN IRRADIATED ALLOYS
N. Q. Lam and P. R. Okamoto 1984 4 p refs Presented at the Symp. on the Scientific Basis for Nucl. Waste Management, Boston, 26-30 Nov. 1984
(Contract W-31-109-eng-38)
(DE85-000080; CONF-841157-4) Avail: NTIS HC A02/MF A01

In order for radioinduced segregation to occur, certain alloy elements need to be coupled to radioinduced defect fluxes. Some observations of local phase changes in Ni-based alloys during ion bombardment and high-voltage electron-microscopic irradiation are reported in this paper. (DLC) DOE

N85-19083# California Univ., Davis. Dept. of Mechanical Engineering.
CAVITATION PHENOMENON IN SUPERPLASTIC CREEP Progress Report, 1 Nov. 1984 - 30 Nov. 1985
Amiya K. Mukherjee 1984 41 p refs
(Contract DE-AT03-79ER-10508)
(DE85-001716; DOE/ER-10508/T2) Avail: NTIS HC A03/MF A01

The deformation mechanisms during superplastic flow of a fine grained 7475 to the minus 5 power to 5 x 10 to the minus 3 power/sec. Al alloy was investigated between 437 and 517 C and strain rates. The mechanical data were analyzed in order to establish the stress, temperature and grain size dependence of the strain rate. It was found that the activation energy is equal to that for grain boundary diffusion and stress exponent = 2.00. This indicates that the dominant mechanism of superplasticity could be grain boundary sliding accommodated by dislocation motion. A comparison of the experimentally determined rate parameters for superplastic flow with the predictions of theoretical models supports this conclusion. The topological features with respect to grain size and shape are explained using the grain emerging model, as proposed by Gifkins. DOE

N85-19084# SRI International Corp., Menlo Park, Calif.
ADSORPTION THERMODYNAMICS AND SURFACE TRANSPORT OF METAL CATALYST POISONS Annual Report
Henry Wise 22 Oct. 1984 7 p ref
(Contract DE-AM03-76SF-00115)
(DE85-002868; DOE/SF-00115/T12) Avail: NTIS HC A02/MF A01

In order to obtain quantitative data on binding energies of adspecies to metal surfaces, equilibrium studies of sulfur chemisorption were extended to halogen chemisorption on dispersed metal catalysts. A series of measurements was initiated on the coadsorption of sulfur and carbon and their interaction on single crystal transition metals. The relationship between binding energy and activation energy for surface diffusion is being examined by evaluating the diffusion coefficient for sulfur adatom diffusion on single crystal metals as a function of surface coverage, surface orientation and temperature. Heats of adsorption, formation, and

binding energies were determined for the adsorbed species S, C1, and Br on Ni/Al2O3 catalysts. A.S.B.

N85-19085# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
COMPARISONS BETWEEN COMPUTED AND OBSERVED GRAIN BOUNDARY STRUCTURES AND PROPERTIES IN METALS
R. W. Balluffi, P. D. Bristowe, S. E. Babcock, S. W. Chan, E. P. Kvam, and J. S. Liu Oct. 1948 13 p refs
(Contract DE-FG02-84ER-45116)
(DE85-002596; DOE/ER-45116/2) Avail: NTIS HC A02/MF A01

A detailed assessment is given of the extent to which agreement was obtained between experimentally observed and calculated structures and/or properties of grain boundaries in metals. All of the calculations employed pair-wise interaction models. It is concluded in general that the pair-potential modeling is a valuable tool in grain boundary research and often produced detailed results which are in at least semi-quantitative agreement with observations. However, in some cases the agreement is poor and as might be expected, it is clear that the technique is not capable of producing realistic results in all cases. Various problems are pointed out and discussed. DOE

N85-19086# Massachusetts Inst. of Tech., Cambridge. National Magnet Lab. and Plasma Center.
CHARACTERIZATION OF Nb-8 WT % Al WIRES BY ANALYTICAL ELECTRON MICROSCOPY
Wayne E. King (ANL), C. L. H. Thieme, and S. Foner 1984 5 p refs Presented at the Applied Superconductivity Conf., San Diego, Calif., 9-13 Sep. 1984
(Contract W-31-109-eng-38)
(DE85-002726; CONF-840937-18) Avail: NTIS HC A02/MF A01

Analytical electron microscopic observations of longitudinal cross-sections of Nb-8 wt % Al powder metallurgy processed wire are presented. Grains were found of unreacted Nb, Nb-Al which was identified as A15 Nb-Al by convergent beam electron diffraction (CBED), and Nb-Al grains identified as Nb2Al by CBFD. No unreacted Al was found. High resolution TEM views for each phase and for regions at the phase boundaries are also presented. Comparisons of the composition of arc melted Nb3Al are made with the low temperature P/M processed A15 phase. DOE

N85-19087# Bureau of Mines, Avondale, Md.
PICKING OF STAINLESS STEELS: A REVIEW
Bernard S. Covino, John V. Scalera, and Philip M. Fabis 1984 22 p refs
(PB85-111979; BM-IC-8985; LC-84-600164; IC-1984) Avail: NTIS HC A02/MF A01 CSCL 13H

The Bureau of Mines is conducting a study of methods to improve the efficiency of the process used to pickle stainless steels. A review of the literature on pickling of stainless steels showed that the chemistry of several process operations involved in the pickling of stainless steels is not fully understood, and that further research could improve the pickling efficiency. The benefits of this research would be a reduction in the annual loss of several thousands of tons of critical minerals such as nickel and chromium, and a reduction in the amount of solids and spent acid solution that are currently discarded. Author (GRA)

N85-19088# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MATERIALS SCIENCE AND METALLURGY
20 Dec. 1984 74 p Transl. into ENGLISH from various Russian articles
(JPRS-UMS-84-008) Avail: NTIS HC A04

Various topics relating to metallurgy are addressed, including aluminum alloys, amorphous materials, composite materials, ferrous metallurgy, heat treatment, and superalloys. In addition, titanium, mechanical properties, powder metallurgy, and welding are discussed. For individual titles, see N85-19089 through N85-19133.

N85-19089# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SURFACE CRACKS IN AMg6 ALLOY UNDER LOW-CYCLE LOADING CONDITIONS Abstract Only
V. A. Strizhalo, A. Ya. Krasovskiy, A. L. Kallinskiy, and I. V. Kramarenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 1 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 7, Jul. 1984 p 23-32 Original language document was announced in IAA as A84-43914 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A comprehensive study has been made of the development of surface cracks in 10-mm thick rolled sheets of AMg6 alloy develop into through cracks and that the crack growth rate is determined by both the stress intensity factor and the cycling stress. Fracture morphologies are presented for various parts of the fatigue fracture diagrams and it is shown that the formation of the fracture surface depends on the anisotropy of the material. V.L. (IAA)

N85-19090# Joint Publications Research Service, Arlington, Va.
K SUB 1* -n DIAGRAM OF CYCLICAL CRACK RESISTANCE OF ALUMINUM ALLOYS Abstract Only
V. S. Ivanova and S. A. Kunavin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 2 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 4, Jul. - Aug. 1984 p 148-153 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The K(sub 1*)-n diagram is presented for aluminum-based alloys, relating n to the threshold values of K(sub 1*) corresponding to the boundaries of self-similar crack growth. Macro- and microfractographic methods of fracture analysis were used to determine the threshold values of K(sub 1*). The values of K(sub 1*) corresponding to agreement between macroscopic crack growth rate and microscopic rate, calculated from the ferrostep, were also determined. The parameter n represents the sensitivity of the material to cracks and K(sub 1*) represents the boundary of self-similar crack growth. Equations are derived for calculation of the boundaries of similar crack growth on the basis of parameter n when the maximum and minimum elastic-plastic constriction are realized. The data obtained show that stage II of fatigue crack growth corresponds to the characteristic signs of self-similarity. Author

N85-19091# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF EXCESS PHASES ON FRACTURE TOUGHNESS OF CAST ALUMIUN-MAGNESIUM-ZINC ALLOY Abstract Only
N. A. Belov, Yu. V. Yevseyev, and V. S. Zolotorevskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 3 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Tsvetnaya Met. (Ordzhonikidze, USSR), no. 3, May - Jun. 1984 p 78-63 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The influence of excess phases of crystallization origin on the fracture toughness of AL+7% Mg+3% Zn with the addition of iron, silicon, and copper was investigated along with the influence of the addition of such transition metals as manganese, titanium, chromium, and zirconium. Specimens for the study were prepared in an electric resistance furnace in a graphite-chamotte crucible. After refining with hexachloroethane they were poured at 710 to 720 C into a steel mold with an inner cavity 20 x 200 x 800 m allowing a cooling rate of about 200 K/min. The 2-kg ingots produced were hardened. Specimens 13 x 26x 120 mm in size of alloys containing 0.1% Ti, 0.1% Zr, 0,2 to 0.8% Mn, and 0.3% Cr were cut for fracture toughness studies. The phases Mg2Sr and Ti(AL, Mg, Zn, Cu) were found to decrease fracture toughness more strongly than did FeAL3. Small quantities of the transition metals could increase fracture toughness, while the formation of excess phases of crystallization origin and large secondary inclusions was accompanied by a decrease in fracture toughness. Author

N85-19092# Joint Publications Research Service, Arlington, Va.
STUDY OF SUPERPLASTIC ALLOYS BASED ON Al-Zn-Ca Abstract Only
V. K. Portnoy and V. M. Ilyenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 3-4 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Tsvetnaya Met. (Ordzhonikidze, USSR), no. 3, May - Jun. 1984 p 70-74 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Conditions of production and superplastic deformation of sheets of alloys in the system Al-Zn-Ca were studied in order to optimize those conditions and to determine the possibility of hardening alloys by additional alloying. Ingots of Al-5% Zn-5% Ca (ATSK) were produced and three cooling rates used to determine the influence of cooling rate of superplasticity. It was found that the casting properties of ATSK with composition on the double eutectic line are favorable for the reduction of good quality ingots under various casting conditions. Workability was insufficient to produce rolled products without cracks below 500 C. In the superplastic state, ATSK alloy has a fine grain structure consisting of an aluminum solid solution and complex intermetallide, probably CaZnAl3. The influence of the addition of magnesium and copper on strength of the alloy at 20 C was studied. Copper was found to be less effective than magnesium at hardening. Superplasticity appeared at 400 to 600 C, the optimal rolling temperature was 550 C, and the optimal superplastic deformation rate was 1/100s. R.S.F.

N85-19093# Joint Publications Research Service, Arlington, Va.
CHEMISTRY INSTITUTE'S ADVANCES IN MAKING EXTRA-PURE ALUMINUM Abstract Only
R. Khamidov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 5 Transl. into ENGLISH from Trud (Moscow), 30 Oct. 1984 p 3 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Advanced in obtaining extra-pure aluminum at the laboratory of metallurgy of pure metals of the Tadzhik Academy of Sciences' Institute of Chemistry are reported. A process for obtaining aluminum in which the content of impurities does not exceed one ten-thousandth of one percent was developed. The process is said to rely on conventional equipment and technological procedures which were previously perfected. Therefore it is thought that a real possibility exists for making it an industrial process in a relatively short period of time. In addition to machine building and electronics, applications are seen in cryogenic and solar energy technology. It is said that extra-pure aluminum is one of the metals that can hold up in cryogenic conditions, becoming a hyperconductor, and that in solar-energy systems it is more effective and economical than alloys currently used. It is also claimed that aluminum that is 99.99999 percent pure was obtained in a vacuum-heating unit. Author

N85-19094# Joint Publications Research Service, Arlington, Va.
MECHANICAL PROPERTIES OF Be-Al COMPOSITE Abstract Only c24
G. I. Volokita and G. Ye. Pletenetskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 8 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 110-112 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The possibility of producing a Be-Al layer-type composite with high volumetric content of beryllium, up to 70 to 80% by volume, was studied. Tensile tests of the composites and components were performed at 300 and 673 K at a loading rate of 1.0 mm/min. Bending tests were performed at 300 K with a 3-point loading system. The best strength characteristics relative to the composite were produced with a rolling compression of 50% in a single pass. Intermediate annealing leads to an increase in relative elongation by up to 4 to 6% with a slight decrease in strength. Increasing deformation to 65% decreases strength and ductility. Ductility of the composite is 2 to 4 times greater than that of beryllium. The strength was calculated by the refined additive rule, indicating that the components are strongly bonded. Increasing the volumetric fraction of beryllium to 70 to 80% creates more favorable conditions for homogeneous deformation of the components of the composite. R.S.F.

N85-19095# Joint Publications Research Service, Arlington, Va.
CALCULATING RESIDUAL STRESSES IN COMPOSITE MATERIALS Abstract Only c24
A. I. Yepishin, Ye. N. Pirogov, and V. P. Konoplenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 9 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 113-117 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A method is presented for calculating residual stresses in fiber composites, using the model of coaxial cylinders. It is assumed that the hardening fiber is elastic, while the matrix experiences elastic, plastic, and viscous deformation. Calculation is based on the theory of flow using the method of supplementary deformations, requiring preliminary solution of the elastic problem with supplementary deformations. The following positive aspects of the calculation method are noted: performance of significant analytic transforms before numerical solution, simplifying computation and increasing accuracy and the use of the flow theory which allows the history of loading to be considered and a transition to be made to the study of rheologic effects such as the study of the influence of residual stresses on the first stage of creep. Author

N85-19096# Joint Publications Research Service, Arlington, Va.
SPREADING UPON COMPACTING OF FIBER COMPOSITE MATERIALS WITH POROUS METAL MATRIX Abstract Only c24
B. A. Arefyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 9 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The question of deformation of the matrix in the presence of fiber in a composite material produced by compression has been studied widely, but most previous work ignored the process of deformation of the material in the direction perpendicular to the fiber - spreading. To reveal the characteristics of this process, spreading between two parallel plates was studied. Equations were derived which indicate that the spreading occurs in all stages of deformation of composites during compacting. The amount of spreading depends primarily on the parameters of the deformation focus and the design of the initial packet of matrix and fibers which is compacted. The packet includes a porous metal matrix. The length of the slip zone varies significantly. As relative porosity decreases there is an increase in the length of the slip zone, while an increase in volumetric fiber content also causes an increase in spreading. Author

N85-19097# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF VOLUMETRIC FIBER CONTENT ON SOME MATRIX DAMAGE FACTORS DURING THERMAL CYCLING OF TUNGSTEN-EI 765 COMPOSITE Abstract Only c24
V. I. Yeremenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 10 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 101-105 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A composite consisting of the chrome-nickel alloy EI 765 plus unidirectional high-purity tungsten fibers was studied. The heating and cooling rates were the same; holding time at the maximum temperature varied from 0 to 10 hours. The composite was constantly loaded with a tensile stress of 300 MPa in all cases. Damage rates were calculated on the basis of a deformation model of accumulation of damage. During heating and cooling, creep and plastic deformation of the matrix change significantly in narrow temperature intervals. In the area of reduced plasticity, static damage is slight and not dangerous. Increasing holding time at

the maximum temperature causes an increase in almost all types of damage to the matrix, particularly static damage due to creep. Durability of the matrix material increases with increasing distance from the phase boundary with the fibers. Composites with a small volumetric fraction of figers show a particularly great difference in durability in these areas. R.S.F.

N85-19098# Joint Publications Research Service, Arlington, Va.
STUDY OF SURFACE DAMAGE IN CATHODE COMPOSITE MATERIALS IN A HIGH FLUX CO2 LASER Abstract Only **c24**

G. G. Gnesin, G. V. Levchenko, R. B. Luban, V. A. Barsuk, V. M. Nesterenko, and M. Z. Filimonov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 10-11 Transl. into ENGLISH from Poverkhnost (Moscow), no. 7, Jul. 1984 p 107-111 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Composite materials for emitters based on tungsten, copper, molybdenum, and copper and containing LaB6 inclusions were tested in an LT-1 commercial high flux CO2 laser. Electrodes were prepared by powder metallurgy methods and soldered into ceramic cathode elements. Visual inspections were performed over the course of 2 years operation of the cathode elements. No significant changes were observed during the first four months. However, after opening the gas discharge chamber it was found that a thin layer of film had formed on the working surfaces of all cathode elements. Subsequent operation of the elements for 1 year 8 months showed that they supported stable glow discharge with slight overgrowth of the emitter surface. Examination with an optical and an electron microscope showed that the products of erosion and corrosion of the emitter had been deposited both on its surface and on the surface of the ceramic of the electrode elements. R.S.F.

N85-19099# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE ESTIMATE OF COMPATIBILITY OF FIBER COMPOSITE MATERIAL COMPONENTS Abstract Only **c24**

A. A. Zabolotskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 11 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 4, Apr. 1984 p 22-28 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A method for quantitative estimation of the compatibility of fiber composite material components was developed which takes into account not only temperature and time, but also pressure in the formation and use of the composites. The degree of interaction of components as various factors act on the composite materials was also estimated. A two-stage table of equations describes the characteristics of composite material states as a function of the ratio of coefficients describing the activation energy of processes and empirical coefficients. Equations describe the effects of mechanical action, time and temperature as well as the degree of compatibility and interaction among components, considering the kinetic nature of the various interactions. The level of interaction varies with mechanical properties and failure mechanism of the composites. The equations can be used to estimate the potential effective properties of composites, optimal technological conditions for their production, and the condition of composites produced under actual conditions. Author

N85-19100# Joint Publications Research Service, Arlington, Va.
STUDIES OF STRUCTURE AND MECHANICAL PROPERTIES OF CARBON-REINFORCED PLASTIC BASED ON SPIRALLY REINFORCED FILLER Abstract Only **c24**

G. Ye. Freger and B. B. Ignatyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 12 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 3, May - Jun. 1984 p 397-401 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Materials were studied based on VMN-4 carbon cord saturated with epoxy binder plus a spiral reinforcement of NSK150/2 glass fiber. The variation in degree of filling of elements of the main reinforcement with carbon fibers as a function of pressing pressure was experimentally studied. A formula is derived for calculating the degree of filling of elements of the main reinforcement. The influence of structural parameters of a reinforcement is studied. It is most desirable from the standpoint of maximum preservation of characteristics of the material in the direction of reinforcement to wind the fine filament with a spacing assuring mutual placement of each turn of the winding in intervals between turns of neighboring elements. If this condition is met materials can be obtained with degree of filling of the main reinforcement 50 to 60% by volume, assuring preservation of elastic characteristics of the material. Tests show that in tensile strength testing in the direction of reinforcement, materials with spirally reinforced fibers are equal to unidirectionally reinforced materials, but the strength utilization factor of the main reinforcement increases. The strength utilization factor under compressive loading is still higher. Author

N85-19101# Joint Publications Research Service, Arlington, Va.
THE PROBLEM OF PROTECTING THE STRUCTURE OF A PACKET COMPOSITE OF OPTIMAL THINWALL ELEMENTS Abstract Only **c24**

Yu. S. Nshinyan *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 12-13 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The problem of finding the optimal structure for a packet of thinwall plates and shells manufactured of composite material monolayers are investigated. Optimal structures are studied, i.e., plans which optimize certain characteristics such as strength, stability, rigidity, etc. with fixed mass and limitations on other parameters are used. The data obtained are compared with the characteristics of optimal multiyear structures allowing determination of the additional gain, which can be achieved by varying the structure. The results indicate that over a broad range of geometries for carbon-reinforced plates the optimal parameter can yield a significant gain in load-bearing capacity. Quasi-isotropic structures in the integral sense have characteristics quite close to optimal. The mathematical method suggested can be used to find the thickness-variable optimal structure both in terms of strength and in terms of stability and oscillations. Author

N85-19102# Joint Publications Research Service, Arlington, Va.
LASER RUPTURE OF COMPOSITE MATERIALS Abstract Only **c24**

A. A. Rassokha *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 13 Transl. into ENGLISH from Mekhan. Kompozitnykh Materialov (Riga), no. 3, May - Jun. 1984 p 462-465 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Results are presented from an experimental determination of the coefficients of reflection of laser radiation and energy of laser rupture of a number of composite materials. It is demonstrated that there is a correlation between the energy of laser rupture and material strength. The analogy between the interaction of the laser radiation pulse with a composite and a solid body with the corresponding kinetic energy and a speed much less than the speed of sound in the composite is discussed. The laser radiation refraction coefficients were several times less than the reflection coefficients of the structural metals and alloys tested. The specific energy of laser rupture of the composite materials was several times greater than the corresponding energy for metals. Carbon-reinforced plastic and boron-reinforced plastic have anomalously high specific laser rupture energies. There is good correlation between specific laser rupture energy and strength and rigidity of composite materials with various contents of reinforcing fibers. An analogy is suggested between the interaction of radiation with the composite and the interaction of a composite with a body moving at a velocity much greater than the speed of sound. Author

N85-19103# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND PROPERTY FORMATION MECHANISM IN MAGNETITE ALLOY-BINDER COMPOSITE Abstract Only **c24**

T. Ya. Malysheva, V. Yu. Zozulya, P. D. Rabina, L. D. Kuznetsov,

O. A. Dolitskaya, I. I. Podolskiy, A. M. Alekseyev, and V. N. Yefremov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 14-15 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Met. (Moscow), no. 4, Jul. - Aug. 1984 p 3-9 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The mechanism of interaction between magnetic alloy and potassium aluminosilicate binder during heating of a system in an oxidizing medium was investigated along with the influence of the phase tranformations which occur in this process on the strength and hygroscopicity of the composite produced. Studies of the phase composition of the system sintered at 550 C by optical and micro X-ray spectral methods showed that the composition and microstructure of the magnetite granules remained unchanged in comparison to unroasted granules. Comparison of mineral formation processes at 550 and 110 C indicate different depths of interaction between the components. At 1100 C, the potassium, silicon, calcium, and iron in the binder and magnetite alloy granules diffuse into each other. Specimens sintered at 550 to 1000 C with only superficial mineral formation reactions have relatively low strength. Specimens roasted at 110 to 1200 C, with deep mutual diffusion of elements, show significantly greater strength, up to 5.2 MPa. The phase transformations which occur during roasting determine hygroscopicity, water capacity decreasing from 0.5 mass % to 0.05 mass % as roasting temperatures increase from 550 to 1100 C. Author

N85-19104# Joint Publications Research Service, Arlington, Va.
IMPACT TOUGHNESS OF COMPOSITES WITH LAYERED MICROSTRUCTURE OF OT4 TITANIUM ALLOY Abstract Only **c24**
V. N. Rodionov and V. V. Peshkov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 15 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Tsvetnaya Met. (Ordzhonikidze, USSR), no. 3, May - Jun. 1984 p 111-113 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The fracture of layered microstructure composites of OT4 titanium alloy during impact toughness testing was studied. Specimens with uniform and controlled volumetric content of layers with large grain plate structure were obtained by diffusion welding of sheet rolled goods 0.3 to 1.0 mm thick with finely dispersed and coarsely dispersed plate type structures at 950 C, pressure 5.0 MPa for 60 minutes. The mechanical properties of the composites were estimated. It was shown that the fracture of titanium multilayer composite in impact testing depends on D sub k and the placement of the notch with respect to the structural layers. when a crack propagates through the uppermost layer with large grain structure and reaches the layer with finer grain structure, crack rebirth occurs. It is suggested that the creation of structured multilayer composites can be effective in controlling fracture toughness. E.A.K.

N85-19105# Joint Publications Research Service, Arlington, Va.
FIBER COMPOSITE MATERIALS WITH TITANIUM MATRIX Abstract Only **c24**
V. I. Bakarinova, M. Kh. Shorshorov, and V. N. Meshcheryakov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 16 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 90-96 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Titanium-matrix composite materials hardened by high-strength and high-modulus fibers and wires are received. The technological stages involved in development of the materials, the problem of physical-chemical interactions in the materials which are thermodynamically unstable at temperatures over 700 C and the mechanical properties of the composites are discussed. High strength levels are observed in the longitudinal direction, with relatively high strength transverse to the fibers. It is found the an Al-B composite is superior in specific longitudinal strength and specific modulus of elasticity to titanium-based materials. However, the specific transverse strength of all titanium-based composites is two to four times greater than that of the aluminum plus boron composite. Another advantage of titanium-matrix composites is their high shear strength, about 500 MPa at room temperature, 250 MPa at 540 C. Impact toughness of the composites increases with increasing volumetric content of fibers if the fibers are more plastic than the matrix, decreasing if the fibers are more brittle. Longitudinal fatigue strength of titanium and aluminum-matrix composites reinforced with boron at 10,000 cycles is similar, but at 10 million cycles the fatigue strength of titanium-matrix composites is significantly less. E.A.K.

N85-19106# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF VAPOR PHASE CONTENT WHEN METALS ARE STRUCK BY LASER RADIATION PULSES OF VARIOUS DENSITIES Abstract Only
A. N. Pilyankevich, V. Yu. Kulikovskiy, and L. R. Shaginyan *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 17 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 7-11 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The vapor phase content in the products of destruction of various metals exposed to pulsed laser radiation at various densities but at constant energy per pulse and the rate of evaporation of these metals were determined. It was assumed that the evaporation of different metals when exposed to the same sort of radiation could be used to estimate various thermophysical characteristics of the metals influence the effectiveness of expenditure of energy for conversion of the substance to a vapor. At the lower energy density the depth of the creater is significantly less than its diameter and the relative content of vapor phase is higher than at the higher energy density, which produces deeper but narrower craters. A correlation was observed between the vapor phase content and the difference between the temperature of rapid evaporation and the melting of the metals. Since evaporation of metals by Shott laser pulses forms an intermediate liquid phase pulsed laser deposition of films can be used only if macrodefects in the films do not represent a significant problem. E.A.K.

N85-19107# Joint Publications Research Service, Arlington, Va.
DAMAGE TO BORON FIBERS DURING THERMAL CYCLING AND ANNEALING Abstract Only
V. S. Yerasov, Ye. N. Pirogov, V. P. Konoplenko, Ye. V. Nikeshicheva, A. M. Tsirlin, Ye. A. Shchetilina, and N. M. Balagurova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 18 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 106-109 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The effect of thermal cycling and annealing on the strength and fractographic characteristics of boron filaments was studied. Uncoated boron filaments 96 and 137 microns in diameter were tested, as well as filaments with coatings of silicon carbide 98 and 145 microns in diameter, and filaments with boron carbide coating 143 microns in diameter. Thermal cycling and annealing were performed in a thermostat allowing maintenance of the maximum cycle temperature and annealing temperature. Strength loss of the fibers during annealing and thermal cycling in air is related to corrosive processes which occur more rapidly during thermal cycling. The silicon carbide or boron carbide coatings decrease the negative influence of tempering and thermal cycling by decreasing the rate of corrosion on the surface of the fiber. E.A.K.

N85-19108# Joint Publications Research Service, Arlington, Va.
TEMPERATURE VARIATION OF LASER MIRROR STABILITY CRITERIA Abstract Only **c24**
S. B. Koshelev and V. V. Kharitonov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 18 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 139-141 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Permissible light fluxes on laser mirrors are determined as a

function of mirror temperature in the range from 4 K to the melting point. It is shown that cryogenic mirrors operating in both steady and pulsed modes can withstand greater thermal loads than mirrors at room temperature. Determination of the maximum permissible thermal load of initially cold mirrors, heated by radiation, requires numerical solution of the heat conductivity and thermoelasticity equations of the mirror material, a medium with variable physical properties. It is confirmed that cryogenic mirrors are at an advantage because of permissible light flux when operating in pulsed conditions. E.A.K.

N85-19109# Joint Publications Research Service, Arlington, Va.
EXCITATION MODES AND PARAMETERS OF STRESS WAVES IN METAL EXPOSED TO SINGLE LASER PULSES Abstract Only **c36**
V. I. Averin, A. I. Avrov, B. I. Gromov, M. V. Yerofeyev, A. A. Kalin, and I. A. Leontyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 19 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 23-27 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Four modes of excitation of pulsed stresses using transparent and absorbing coatings were studied. Laser radiation was focused in a 5-mm-diameter and 1 to 20 mm thick. The stress wave profile was recorded by quartz piezoelectric plates 5 mm in diameter and 0.3 mm thick. The dimensions and characteristics were selected to yield waves with minimal distortion. Three types of coatings were studied a thin layer of black enamel, a thick glass plate, and their combination. It was found that the combined use of the rigid barrier and volatile nontransparent coating on the surface of the metal increased the amplitude of the stress pulse excited. The waves propagate as elastic longitudinal waves. E.A.K.

N85-19110# Joint Publications Research Service, Arlington, Va.
NEW METHOD FOR HEAT TREATMENT OF METALS Abstract Only
Boris Goldberg *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 21-23 Transl. into ENGLISH from Sov. Kirgiziya (Frunze, USSR), 23 Sep. 1984 p 3 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A new method for the heat treatment of metals is discussed. Machine tools are submerged into a receptacle of liquid nitrogen and then cooled. Resistance and hardness properties were found to increase with this method. B.W.

N85-19111# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF LASER HARDENING ON MECHANICAL PROPERTIES OF TYPE 45 STEEL WITH VARIOUS PRELIMINARY HEAT TREATMENTS Abstract Only
V. S. Velikikh, V. S. Kartavtsev, A. V. Romanenko, and V. F. Terentyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 24 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 12-17 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Laser hardening of the surface layer of metals results in a significant increase in fatigue durability and endurance limit. This work studies the influence of laser hardening on the mechanical properties of type 45 steel with various preliminary heat treatments in tensile, fatigue and wear tests. The structure and distribution of residual stresses in the surface layer after laser hardening are also studied. Pulsed laser hardening was performed on a KVANT-18 installation in air with a laser pulse energy of 85 J, hardening spot diameter 7 mm, pulse length 8 ms. The laser hardened layer was 100 micro m deep. Hardening was also performed with a CO2 laser with a radiation power of 500 W, producing a hardened layer 150 micro m deep. Pulsed laser hardening following thermal hardening plus tempering a over 400 C is found to cause an increase in tensile strength, but a decrease in tensile strength results in metals which were tempered at less than 400 C. CO2 laser hardening forms residual compressive stresses in the surface layer and increases the fatigue limits or normalized type 45 steel specimens by 14%. B.W.

N85-19112# Joint Publications Research Service, Arlington, Va.
STRENGTH AND FAILURE OF CERAMIC-METALLIC MATERIAL Abstract Only
S. M. Barinov, V. S. Ivanov, and Yu. L. Krasulin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 25 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 118-123 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

This work continues a study of the relationship of mechanical properties of cermets with their structure. Comparative studies are presented of the fracture toughness, deformation, strength and thermal stability of the cermets LaCrO3-Cr obtained by high-speed (explosive) and static pressing of powder mixtures with subsequent sintering. The temperature variation of mechanical properties of the cermet 60% LaCrO3-40% Cr were studied in the 20-1200 C interval. The relative density of the material produced by explosive pressing was 96%, by static pressing - 91 to 92%. Beam specimens measuring 3 x 5 x 40 mm were loaded in 3-point flexure in an atmosphere of argon, traverse movement speed 8 x 10 to the minus 6 power m/s. Thermal stability testing was performed by subjecting cylindrical specimens 10 mm in diameter and 20 mm high to thermal shock at 20-2150-20 C, cooling in air at 300 C/min. The studies showed that the specific organization of the structure of cermets produced by high-speed pressing significantly increases deformation, strength, fracture toughness and thermal stability of the material. Author

N85-19113# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF PRODUCTION OF COMPOSITE DIAMOND-CONTAINING MATERIALS USING TITANIUM CARBIDE-STEEL ALLOYS Abstract Only **c24**
V. K. Narva, N. S. Loshkareva, A. M. Akhmedzyanova, E. S. Simkin, S. I. Sklyar, and N. V. Tsypin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 30 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 7, Jul. 1984 p 21-25 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A study was made of the possibility of producing diamond containing material with titanium steel binder instead of the normal composite diamond containing material based on hard alloy. Charges containing 10, 30 and 40% TiC with steel binder types Kh6V3M and 5Kh6VM2 were prepared with both natural and synthetic diamonds by hot pressing and sintering in a high pressure chamber and in a vacuum. The quality of sintered specimens was monitored on the basis of density and wear resistance. Best results were obtained with hot pressing of alloys containing 10% TiC. Increasing the quantity of carbide resulted in extrusion of steel binder through the graphite mold, increased porosity and decreased wear resistance. Heat treatment was found to have a slight, at times negative, influence on the hardness of materials sintered in the high pressure chamber. When vacuum sintering was used, the best results were obtained for alloys with 40% TiC. High pressure chamber sintered materials were harder than those sintered in a vacuum. The vacuum sintered materials had the greatest wear resistance. The properties obtained were equal to those of tungsten group hard alloy based materials. Author

N85-19114# Joint Publications Research Service, Arlington, Va.
KINETICS OF SATURATION OF POROUS TITANIUM WITH LOW MELTING POINT METALS Abstract Only
V. G. Yenevich, D. M. Karpinos, A. B. Sapozhnikova, and L. I. Tuchinskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 30-31 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 7, Jul. 1984 p 14-16 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Experiments were performed on specimens 10 mm in diameter and 120 mm in length made by pressing and sintering of type PTS titanium powder. The porosities of the specimens were 22,

33, 50, 67, and 76%. Saturating metals included bismuth, lead, tin and Wood's alloy. The specimens were saturated in a medium of dry argon. Depth of penetration was judged from the increase in weight of the saturated specimen. In Ti-Bi, saturation occurs but the significant stresses which arise upon cooling of saturated specimens lead to deformation and rupture. In Ti-Pb, Ti-Sn and Ti-Wood's alloy spontaneous saturation occurs. These three alloys can be produced over a wide range of concentrations of the components by capillary saturation. Processes of physical and chemical interaction of the components in contact greatly influence the parameters of saturation. Author

N85-19115# Joint Publications Research Service, Arlington, Va.
ANTIFRICTION PROPERTIES OF GAS THERMAL COATINGS OF CLAD CARBINE POWDERS Abstract Only
Yu. S. Borisov, T. P. Geleyshvili, L. N. Gorbatov, A. G. Molyar, E. A. Kulgavyy, and I. Ye. Polishchuk *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UmS-84-008) 20 Dec. 1984 p 31-32 Transl. into ENGLISH from Porosh. Met. (Kiev), no. 6, Jun. 1984 p 45-47 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A study is made of the antifriction properties of atomized coatings on VI-22 titanium alloy. Atomization was performed with carbides of titanium and chromium clad with cobalt, copper or nickel. Cladding was performed by the autoclave method by reducing copper, cobalt and nickel from a solution of their salts with hydrogen under pressure. The clad coating thickness was 3 to 5 micro m. Electrolytically chrome plated titanium alloy and coatings of oxides were also tested for comparison. The structure of the coatings after atomization consisted of carbide particles uniformly distributed in a metal matrix. In friction the coatings worked in well, at relatively low coefficient of friction and slight wear. The most effective antifriction properties, minimum wear and minimum coefficient of friction were achieved in coatings of composite TiC-CO and TiC-Cu powders. Author

N85-19116# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF TEMPERATURE ON WEAR RESISTANCE OF DETONATION COATINGS OF ALLOY POWDERS Abstract Only
I. G. Nosovskiy, V. V. Shchepetov, V. Kh. Kadyrov, and L. A. Kotlyarenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 33 Transl. into ENGLISH from Porosh, Met. (Kiev), no. 4, Apr. 1984 p 37-46 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The effect of temperature on regularities of friction and wear of processes in tungsten free wear resistant coatings atomized by the detonation gas method was studied. Specimens atomized with type VK15 hard alloy powder were also used to provide a comparison of friction and wear characteristics. Detonation coatings of nichrome alloy powder showed the least wear. X-ray phase analysis of 600 C and higher revealed the presence of Cr2O3, CrO3, NiO and NiCr2O4 spinel, which improves the protective properties of the oxide film. The results of the testing showed good operational characteristics in comparison to traditional hard alloys. The coatings can be used in dry friction couples at elevated temperatures. B.W.

N85-19117# Joint Publications Research Service, Arlington, Va.
METHOD OF DETERMINING THERMAL STABILITY OF HEAT-RESISTANT COATINGS ON GRAPHITE Abstract Only
V. V. Alekseyev and V. S. Loskutov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 34 Transl. into ENGLISH from Porosh. Met. (Kiev), no. 4., Apr. 1984 p 35-37 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A study was made of the possibility of producing a thermally stable coating by plasma atomization to be used as an object for testing thermal stability of a rapid method for preliminary selection of coating materials. Experiments were performed on cylindrical specimens of V-1 graphite 40 mm in diameter and 5 mm long. Sharp edges were blunted to a radius of 1 mm. The coating material consisted of powders of the metal and their compounds with particle sizes between 63 and 100 micro m. Coatings were applied by plasma atomization in air to the end of the specimens. Thermal stability was determined with plasma equipment in a special laboratory installation. The results were evaluated visually during thermal cycling. A thermal stability diagram was constructed for the various coatings. Author

N85-19118# Joint Publications Research Service, Arlington, Va.
BEHAVIOR AND SPECIFICS OF FRACTURE OF POROUS FIBER MATERIALS IN EXTENSION Abstract Only c24
A. G. Kostornov and L. G. Galstyan *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 34-35 Transl. into ENGLISH from Porosh. Met. (Kiev), no. 7, Jul. 1984 p 83-86 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Experiments were performed on specimens obtained by directional pressing and high temperature sintering after liquid matting to decrease the influence of structural heterogeneities on strength. Tests were performed at room temperature at loading rates of 10 to 25 mm/min. Deformations were measured with foil tensorestors. It was found from tests of nichrome fibers that beyond the limits of elasticity, Young's modulus of porous fiber materials can be considered practically constant. Tensile testing diagrams of specimens with various porosities were used to establish the ultimate tensile strength and relative elongation of materials made of copper, nickel, chrome and stainless steel fibers of various diameters. The tensile strength was found to vary primarily with fiber strength and quality of contact between fibers, contact quality playing a decisive role. Improving contact quality from 70 to 85% of ideal to 80 to 95% of ideal in nichrome and from 60 to 65% in stainless steel can increase the relative strength by 1.3-2.5 and 1.5-2.8 times. Author

N85-19119# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF GASEOUS HYDROGEN ON STRENGTH AND DUCTILITY OF NICKEL HEAT-RESISTANT ALLOYS Abstract Only c24
G. G. Maksimovich, V. I. Kholodnyy, V. I. Belov, I. Yu. Tretyak, L. M. Ivaskevich, and T. V. Slipchenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 36 Transl. into ENGLISH from Fiz.-Khim. Mekh. Mater. (Kiev), v. 20, no. 3, May - Jun. 1984 p 53-56 Original language doc. was announced in IAA as A84-41792 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The objective of the study was to investigate the effect of hydrogen gas on the mechanical properties of heat resistant nickel alloys in various structural states in the temperature range 290-1073 K. The alloys used in the study were commercial nickel alloys, KhN55MBYu-VD and KhN60MVYu-VD, strengthened by the intermetallic gamma-prime phase. An analysis of experimental results show that hydrogen gas significantly reduces the ductility of the alloys and changes the fracture mode from transcrystalline to intercrystalline. This effect becomes more pronounced with an increase in the amount of the strengthening phase and disappears at about 1073 K. V.L. (IAA)

N85-19120# Joint Publications Research Service, Arlington, Va.
ESTIMATION OF ENDURANCE CHARACTERISTICS OF HEAT RESISTANT MATERIALS. REPORT 2: DETERMINATION OF ENDURANCE LIMIT OF HEAT RESISTANT ALLOYS OVER A BROAD TEMPERATURE RANGE Abstract Only
A. D. Pogrebnak and A. V. Zheldubovskiy *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 37 Transl. into ENGLISH from Probl. Proch. (Kiev), no. 6, Jun. 1984 p 71-74 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The problem of accelerated estimation of the resistance characteristics of structural materials to cyclical loads, particularly determination of the endurance limit using a limited volume of experimental data, is of significant scientific interest. The problem can be solved with sufficient reliability by utilizing the method of recording changes in microhardness during the process of fatigue

to investigate the durability of metals. The literature on microhardness studies in the process of metal fatigue at normal and elevated temperatures is analyzed and indicates that the change in microhardness in the process of cyclical loading of metals at elevated temperatures can be used to determine temperature range of existence of the endurance limit and the stress which corresponds to it at the test temperature. The method of accelerated determination of the endurance limit of heat resistant alloys is based on the specifics of alteration of microhardness as a function of test temperature and applied stress. Author

N85-19121# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF EXTENSION RATE ON STRENGTH AND DEFORMATION CHARACTERISTICS OF TITANIUM ALLOYS OVER A BROAD TEMPERATURE RANGE Abstract Only
V. M. Tokarev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 38 Transl. into ENGLISH from Probl. Proch. (Kiev), no. 6, Jun. 1984 p 92-96 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Results are presented from tensile testing of OT4, VT23, VT3-1 and VT14 titanium alloys at deformation rates of .001 to 100/s at 77 to 773K, both as delivered and after heat treatment. The tests utilized specimens with shortened gage sections 4 mm in diameter and 10 mm in length. The deformation-time and force-time oscillograms produced indicate satisfactory maintenance of constant deformation rate to and beyond the yield point. Thermocouples attached to the surface of the specimens were used to determine specimen temperatures. Heat treatment is found to improve strength characteristics while decreasing ductility within the deformation rates tested at 77 and 523 K. Further increases in temperature result in decreases in the influence of hardening heat treatment. At higher temperatures there is an increase in ductility and a decrease in strength as is characteristic for steel which does not manifest deformation aging. Author

N85-19122# Joint Publications Research Service, Arlington, Va.
KINETICS OF OXIDATION OF TITANIUM ALLOY UPON HEATING TO 1000 DEG C Abstract Only
V. N. Fedirko and A. T. Lizun *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 39 Transl. into ENGLISH from Fiz.-Khim. Mekh. Mater. (Kiev), v. 20, no. 3, May - Jun. 1984 p 76-79 Original language doc. was announced in IAA as A84-41794 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The effect of alloying elements on the oxidation kinetics of commercial titanium alloys, VT1-0, OT4-1, PT7-M, VT5-1, VT14, and VT23, during continuous heating in air up to 1000 C is investigated experimentally using a derivatograph. It is found that Al can either accelerate or retard oxidation, Zr, Mo, and Sn improve the heat resistance of the alloys. Mn has practically no effect, and Cr increases the oxidation rate. At the stage of accelerated oxidation, Mo, Mn, Sn, and Zr significantly increase the oxidation rate of the alloys. However, the oxidation rate of VT14 and PT7-M remains lower than that of commercially pure titanium. Author

N85-19123# Joint Publications Research Service, Arlington, Va.
STUDY OF THE VOLUMETRIC CHANGES IN VT23 ALLOY UPON HEATING Abstract Only
A. A. Ilin, M. Yu. Kollerov, O. P. Nazimov, and V. V. Zasypkin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 39-40 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Tsvet. Met. (Ordzhonikidze, USSR), no. 3, May - Jun. 1984 p 87-91 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Experiments were performed on hot rolled bars of VT23 alloy containing 5.8 mass % Al, 4.3 V, 2.1 Mo, 1.0 Cr and 0.75 Fe. All bars were annealed for 1 hour at 55 C below Ac3. Blanks for specimens for dilatometric and x-ray structural analysis were annealed at 700 to 1000 C for 1 hour, then quenched in water, cooled in air or with the furnace. Depending on the temperature to which the metal is heated, quenching in water produces structures with various metastable phases. Analysis of dilatograms showed that for specimens cooled after annealing in air there is a small negative high-temperature volumetric effect in the 400 to 600 C interval. Regardless of the initial phase composition, the high temperature negative volumetric effect results from a decrease in atomic volume of beta phase due to its enrichment by alloying elements resulting from diffusion exchange with the alpha double prime or nonequilibrium alpha phase. Author

N85-19124# Joint Publications Research Service, Arlington, Va.
STUDY OF INFLUENCE OF COLD PLASTIC DEFORMATION ON AGING OF VT30 ALLOY Abstract Only
M. V. Maltsev and T. N. Volkova *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 40 Transl. into ENGLISH from Inz. Vyssh. Ucheb. Zaved., Tsvet. Met. (Ordzhonikidze, USSR), no. 3, May - Jun. 1984 p 82-87 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Processes of decomposition of the metastable beta phase upon aging of hardened and deformed VT30 alloy were studied in order to determine the specifics of phase transformations occurring in cold deformed alloy in comparison to the undeformed alloy. Specimens were cut from bars hardened from 680 and 800 C, deformed in the cold state by 15% compression then aged by continuous heating to various temperatures from 200 to 550 C. X-ray diagrams of sections of the specimens were obtained after deformation, and hardness was measured perpendicular to the deformation axis. Dilatometric and studies were also performed. The X-ray studies showed that the liberation of the omega phase begins at 300 C and is completed by 450 C. The omega phase disappears at 450 to 530 C. The alpha phase is formed at 510 C. Alpha-phase particles begin to be liberated at a temperature near 500 C. It is concluded that the use of deformation after hardening changes the reaction of decomposition of the beta phase during aging of the alloy, suppressing the liberation of the omega phase and leading the formation of alpha double prime martensite.
Author

N85-19125# Joint Publications Research Service, Arlington, Va.
KINETICS OF JOINT FORMATION DURING DIFFUSION WELDING OF VT5 TITANIUM ALLOYS Abstract Only
V. V. Peshkov, V. N. Rodionov, V. N. Milyutin, and M. R. Nikgolov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 41-42 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 7, Jul. 1984 p 27-31 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Results are presented of the kinetics of formation of joints in VT5 titanium alloy with initial fine-grain equiaxial microstructure (grain diameter 3 to 5 micron) during diffusion welding in the temperature area below the temperature of the end of polymorphous transformation (930 to 980 C). Mechanical properties of the joints were determined using standard impact toughness testing specimens with V-shaped notches. Fractographic studies of welded joint fractures were performed using a scanning electron microscope. Increasing welding time, accompanied by large scale deformations of the specimen, causes gradual accumulation of seizing sections on the surfaces of the grains and disappearance of microdiscontinuities within the contact areas. Fracture then becomes tougher. The observed differences in the structure of fractures and kinetics of formation of joints in the low temperature and high temperature areas can be explained from the standpoint of the mechanism of high temperature creep. B.G.

N85-19126# Joint Publications Research Service, Arlington, Va.
FRACTURE RESISTANCE OF SURFACE LAYER WITH TECHNOLOGICAL DEFECTS UNDER CYCLICAL LOADING c37
V. F. Lukyanov, V. V. Naprashnikov, and G. S. Vasilchenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 43 Transl. into ENGLISH from Svar. Proizvod. (Moscow), no. 6, Jun. 1984 p 3-5 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

During the process of surfacing, defects such as slag inclusions

may be formed in a clad layer. Cyclical deformations arise in the surfaced zone due to pulsations of pressure and temperature, and may exceed the yield point of the austenite material. Defects may thus initiate fatigue cracks. The method of testing large specimens in biaxial axisymmetrical flexure was used to test the fracture resistance characteristics of a surface layer under cyclical loading. Specimens of type 15Kh2NMFA steel were disks 550 mm in diameter and 30 mm thick. Analysis of the kinetics of development of fracture showed that the process of crack formation is stochastic in nature with respect to the direction of application of radial and shear stresses in the area of a group of defects and the direction of surfacing. The use of deformation intensity coefficient as a parameter monitoring the fracture rate allows prediction of the kinetics of crack growth in nuclear powerplant equipment. B.G.

N85-19127# Joint Publications Research Service, Arlington, Va.
FATIGUE RESISTANCE OF WELDED JOINTS OF HIGH STRENGTH STEELS PRODUCED BY ELECTRON BEAM WELDING Abstract Only **c39**
V. I. Zagornikov and S. N. Kovbasenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 44 Transl. into ENGLISH from Svar. Proizvod. (Moscow), no. 6, Jun. 1984 p 25 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

The results of studies of the transverse cross section of seams in steel 12Kh2N4MD showed that softening sectors characteristics for arc welding virtually do not occur upon electron beam welding. Joints were produced by horizontal single-pass welding on a type U-570 installation in sheets of steel hardened during controlled rolling. Fatigue test data indicate that joints produced by electron beam welding are quite serviceable in spite of the presence of zones with different levels of strength properties. Since fracture in fatigue testing occurred in all cases through the base metal, it is concluded that a defect free joint has fatigue resistance equal to or superior to that of the base metals. R.J.F.

N85-19128# Joint Publications Research Service, Arlington, Va.
ESTIMATE OF QUALITY OF ALUMINUM ALLOY SURFACE PREPARATION FOR ARC WELDING Abstract Only
V. I. Ryazantsev, V. A. Fedoseyev, and A. I. Savostikov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 44 Transl. into ENGLISH from Svar. Proizvod. (Moscow), no. 6, Jun. 1984 p 21-23 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Tests are performed of three methods of quantitative estimation of the quality of surface preparation of aluminum alloys before welding or soldering: measurement of contact resistance, potential difference for the quantity and composition of gases in the surface layer upon exposure to a laser beam. Sheet specimens of aluminum alloys 1201, 1420 and AMg6 1.2 to 6 mm thick were used in the studies. Comparison of the data obtained with X-ray studies of welded joints showed that a compressive force of 250 daN provides the most objective data for welding by fusion. The contact potential difference is suitable for estimation of the quality of surface preparation only after chemical cleaning. After brush treatment, contact resistance under the pressure mentioned above is most reliable. The content of hydrogen in the surface layer of alloys AMg6 and 1420 is 7.5 and 59 times more than for alloy 1201, which agrees with the tendency of these alloys toward pore formation during welding. R.J.F.

N85-19129# Joint Publications Research Service, Arlington, Va.
CALCULATION OF MODE FIELD IN ELECTRON BEAM WELDING OF VT6 TITANIUM ALLOY Abstract Only
Yu. I. Psarev, M. S. Baryshev, and A. V. Gerasimenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 45 Transl. into ENGLISH from Svar. Proizvod. (Moscow), no 6, Jun. 1984 p 20-21 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Mathematical models of the welding mode fields, expressing the variation in fusion depth as a function of current and welding speed for optimal focusing current values were calculated in order to reduce the labor required to prepare programs for electron beam welding of VT6 titanium alloy. Models were developed for both vertical and horizontal beam welding with the PL-100 electron beam welding machine (operating distance 200 mm, constant accelerating voltage 60 kV). The equations derived allow calculation of the major parameters of welding modes for blanks of variable thickness in the 100-500 mA beam current range for welding speeds of 10 to 36 meters per hour. Photographs illustrate the macrostructure of welded joints in VT6 alloys for 45and 95-mm-thick blanks welded at 24 meters per hour. R.J.F.

N85-19130# Joint Publications Research Service, Arlington, Va.
DIFFUSION WELDING WITH FORCED DEFORMATION OF HEAT-RESISTANT NICKEL-BASED DISPERSION HARDENED ALLOY Abstract Only **c37**
E. S. Karakozov, A. P. Ternovskiy, T. S. Samsonova, E. V. Davidyan, S. S. Khayurov, and I. S. Polkin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 45-46 Transl. into ENGLISH from Svar. Proizvod. (Moscow), no. 6, Jun. 1984 p 15-17 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Specimens 6 mm in diameter and 10 mm high of a dispersion hardened Ni-Cr-Al-W-Y2O3 alloy with contact surface irregularities 9-13 microns in height after lathe working were welded in a vacuum of 1.3 10-3 Pa. The flow stress sensitivity factor was determined as a function of deformation rate. Analysis of the results obtained showed that under conditions of diffusion welding with forced deformation of the alloy at Epsilon = 3-10% the curves of the variation of log P have a characteristic Sigmoid shape with 3 clearly differentiated velocity intervals of deformation. At over 900 C, plastic deformation of the alloy is determined by mechanism whose activation energy is significantly greater than that of self-diffusion of nickel. The proposed mechanism is bending of dispersed particles of Y2O3 due to creep controlled by volumetric self-diffusion. The temperature of deformation should be over 900 deg C for this type of welding, the deformation rate 1.7 times .0001 to 1.7 times .0015 minus 1. R.J.F.

N85-19131# Joint Publications Research Service, Arlington, Va.
COMPUTATION OF THERMAL SHOCK-FREE STRAIGHTENING CONDITIONS FOR ALUMINUM-MAGNESIUM ALLOY WELDED STRUCTURES Abstract Only **c37**
V. M. Kaikin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 47 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 6, Jun. 1984 p 62-66 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A refinement is presented to a computation method for determining optimal conditions of local heating and establishing the sequence of performance of the process of thermal straightening of aluminum-magnesium sheet goods as a function of the mechanical and thermal characteristics of the material and the type and magnitude of welding deformations. It is found desirable first to eliminate general bending, then straighten local deformations. The plans and conditions of local heating must be determined as a function of the type of welding deformations, thickness of the goods, mechanical and thermophysical characteristics of the material. The economic effect to be achieved from introduction of the improved thermal shock-free straightening system should be about 10,000 rubles at one enterprise, and the external appearance of the goods produced should be improved. R.J.F.

N85-19132# Joint Publications Research Service, Arlington, Va.
ROLE OF HYDROGEN IN PROCESSES OF DEFORMATION AND FRACTURE OF METALS Abstract Only **c37**
S. I. Mikitishin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 63-64 Transl. into ENGLISH from Fiz.-Khim. Mekh. Mater. (Kiev), v. 20, no. 3, May - Jun. 1984 p 23-26 Original language doc. was announced in IAA as A84-41791 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

Two hypotheses are proposed which make it possible to analyze separately the effect of hydrogen on the plastic deformation and the fracture of metals. In accordance with one hypothesis, hydrogen reduces the width of dislocations and increases the Peierls-nabarro forces by increasing the degree of localization of valent electrons. The other hypothesis states that r- and s-type adsorption of hydrogen by metal surfaces leads to a decrease and an increase in the strength of the bonds between the surface atoms. The hypotheses explain the low plasticity of hydrogenated metals and the derease in Poisson ratio, among other effects.
R.J.F.

N85-19133# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF MELTING CONDITIONS ON STRENGTH OF TRANSITION ZONE BETWEEN STEEL AND COMPOSITE MATERIAL Abstract Only
V. Ya. Belousov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 64 Transl. into ENGLISH from Fiz.-Khim. Mekh. Mater. (Kiev), v. 20, no. 3, May - Jun. 1984 p 82-87 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

A study is made of the influence of surfacing conditions (temperature and time of the process) of homogeneous tungsten carbide composites on steel 20 with plastic alloys as the binder. The composites were manufactured by saturation. A charge consisting of refractory macroheterogeneous tungsten carbide granules and plastic alloy powder was pressed into briquettes and sintered in a neutral medium at 1473 deg K for various amounts of time. It was found that as the depth of the diffusion layer increased, its ultimate strength also increased. The less the mechanical heterogeneity of the joint produced between coatings and base, the more favorable the influence of increasing the relative thickness of the diffusion zone. The greater the mechanical heterogeneity of the joint, the thinner the diffusion interlayer must be between the two dissimilar materials. R.J.F.

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-19134*# National Aeronautics and Space Administration, Washington, D. C.
STABLE POLYMERIC CARBON RADICALS. PART 2: ATTEMPTS AT THE PREPARATION OF POLYRADICALS OF THE TRIPHENYLMETHYL TYPE LINKED BY P-PHENYLENE UNITS
Dietrich Braun and Peter Lehmann Jan. 1985 18 p refs Transl. into ENGLISH from Makromolekulare Chem. (West Germany), v. 177, 1976 p 1387-1400 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77799; NAS 1.15:77799) Avail: NTIS HC A02/MF A01 CSCL 11C

As starting materials for the preparation of polyradicals of triphenylmethyl type linked by p-phenylene units bis(4-iodophenylmethane) and bis(4-iodo-2,5-dimethyl-phenylmethane) were synthesized by a Sandmeyer reaction from the corresponding diamino compounds and subsequently transformed into the corresponding polymeric hydrocarbons 6a and 6b by an Ullmann condensation. In the following step 6a and 6b were brominated at the tert. carbon atom by means of N-bromosuccinimide. The reaction of the resulting poly (4,4'-biphenylylen-alpha-bromobenzylidene)s (7a and 7b) with mercury afforded the corresponding radicals, the ESR spectra of which were recorded. From the methyl substituted polymer 7b poly [(2,2'5,5-tetramethyl-4,4'-bi-phenylylen)phenylmethylidyne] was formed, whereas the unsubstituted product 7a was transformed into a para-quinoide polymer with radical properties. Author

N85-19135*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHARACTERIZATION OF A THERMOPLASTIC POLYIMIDESULFONE
James F. Dezern and Philip R. Young Feb. 1985 37 p refs
(NASA-TM-86358; NAS 1.15:86358) Avail: NTIS HC A03/MF A01 CSCL 11C

The detailed characterization of an experimental thermoplastic polyimidesulfone adhesive based on 3,3 prime-diaminodiphenylsulfone and 3,3 prime,4,4 prime-benzophenone tetracarboxylic dianhydride was studied. Model compounds were also examined. Thermal cyclization of the amide-acid to the imide was studied by a variety of techniques including DSC, TGA, MS, in situ diffuse reflectance-FTIR, and flow mearsurement. Characterizations were continued during the processing of adhesive tapes and the fabrication, bonding, and testing of lap shear specimens. Results provide fundamental insights into the role of cure chemistry, and the effects of residual solvent and volatile produces on processing and performance. These insights and the resulting chemical models should lead to more efficient processing cycles for these and other related thermoplastic adhesive systems.
Author

N85-19136*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FACTORS INFLUENCING THE BALL MILLING OF Si3N4 IN WATER
Marc R. Freedman, James D. Kiser, and Thomas P. Herbell 1985 14 p refs Presented at the 9th Ann. Conf. on Composites and Advanced Ceram. Mater., Cocoa Beach, Fla., 20-23 Jan. 1985; sponsored by American Ceramic Society
(NASA-TM-86932; E-2420; NAS 1.15:86932) Avail: NTIS HC A02/MF A01 CSCL 11G

A statistical study of the ball milling of Si3N4 powder in Si3N4 hardware was undertaken to understand how the resulting increase in specific surface area is related to solids loading and mill speed. An attempt was made to optimize milling conditions. The degree of comminution was more dependent upon solids loading than mill speed. A practical grinding limit between 0.5 and 0.75 microns was achieved in 144 hr independent of solids loading. Ball mill wear and media wear were independent of both solids loading and mill speed. E.A.K.

N85-19137*# Martin Marietta Aerospace, Denver, Colo.
EVALUATION AND PREDICTION OF LONG-TERM ENVIRONMENTAL EFFECTS OF NONMETALLIC MATERIALS Final Report
Harold Papazian Jan. 1985 29 p refs
(Contract NAS8-33578)
(NASA-CR-171353; NAS 1.26:171353; MCR-85-506) Avail: NTIS HC A03/MF A01 CSCL 11G

The properties of a number of nonmetallic materials were evaluated experimentally in simulated space environments in order to develop models for accelerated test methods useful for predicting such behavioral changes. Graphite-epoxy composites were exposed to thermal cycling. Adhesive foam tapes were subjected to a vacuum environment. Metal-matrix composites were tested for baseline data. Predictive modeling designed to include strength and aging effects on composites, polymeric films, and metals under such space conditions (including the atomic oxygen environment) is discussed. The Korel 8031-00 high strength adhesive foam tape was shown to be superior to the other two tested.
R.S.F.

N85-19138# Rockwell International Corp., Anaheim, Calif. Science Center.
WATER ABSORPTION AND CONDUCTIVITY IN POLY (ETHYLENE OXIDE)-LITHIUM TETRAFLUOROBORATE FILMS Technical Report, 1 Jan. - 31 Dec. 1983
M. M. Nicholson and T. P. Weismuller Oct. 1984 32 p Submitted for publication
(Contract N00014-77-C-0636; NR Proj. 359-667)
(AD-A147969; SC5384.1TR; TR-6) Avail: NTIS HC A03/MF A01

CSCL 11/9

Water-vapor absorption and conductivity in spin-cast poly(ethylene oxide)- lithium tetrafluoroborate films were investigated near 21 deg C by in situ near-infrared spectroscopy and ac conductance measurements. The film conductivity was less than or = .0002 ohhms/cm until the water content exceeded that corresponding to LiBF4.3H2O. It increased with additional water, reaching .003 ohms/cm at the composition equivalent to LiBF4.20H2O. Most of the water above the trihydrate level was unstably absorbed, however, and began to escape from the film within a few minutes. This syneresis was attributed to spontaneous restructuring or crystallization of the polymer. The conductivity data were interpreted on the basis of a two-phase model in which one portion of the salt remained in a nonconductive solid region, while the other portion dissolved in a more fluid conductive polymer-water region. GRA

N85-19139# Lehigh Univ., Bethlehem, Pa.
CHARACTERIZATION OF NOVEL BINDERS BASED ON ENERGETIC THERMOPLASTIC ELASTOMERS Technical Report, 1 Oct. 1983 - 30 Sep. 1984
L. H. Sperling 30 Sep. 1984 6 p
(Contract N00014-82-K-0050)
(AD-A148993; AD-E301513) Avail: NTIS HC A02/MF A01 CSCL 11/9

Beginning in the fall of 1981, a research program was undertaken to develop a series of block copolymers based on novel polyethers. This research is part of the low vulnerability ammunition, LOVA, program of the office of naval research. The principal polymers of interest in this program are the crystalline polyBEMO and polyBAMO, and their thermoplastic elastomers. The most important findings of the past year are: PolyBEMO decomposes endothermally at elevated temperatures, meeting an important LOVA objective of safer compositions; The use temperatures of polyBEMO, polyBAMO, and their block copolymers range from -30 to +75 C. The modulus of the block copolymers is leathery to rubbery, depending on the composition; processing can be carried out in the range of 80-110 C; and PolyBEMO and polyBAMO are highly crystalline materials. PolyBEMO exhibits more than one crystalline form. Major focus of the research has been to characterize the thermal and physical behavior of these materials. GRA

N85-19140# National Materials Advisory Board, Washington, D.C.
RELIABILITY OF ADHESIVE BONDS UNDER SEVERE ENVIRONMENTS. REPORT OF THE COMMITTEE ON RELIABILITY OF ADHESIVE BONDS IN SEVERE ENVIRONMENTS Final Report, 1 Feb. 1984 - 31 Jul. 1985
1 Dec. 1984 60 p
(Contract MDA903-82-C-0434)
(AD-A149010; NMAB-422) Avail: NTIS HC A04/MF A01 CSCL 11/1

A workshop organized by a National Research Council committee and entitled reliability of adhesive bonds in severe Environments was attended by about 100 invited experts. The detailed findings, reported herein, include the recommendation that the federal government spearhead a major effort to overcome the open issues that currently prevent the reliable structural use of adhesive bonding in severe environments. A pervasive comment was that the interdisciplinary nature of the subject requires close interaction of the experts on the chemistry, interphase science, and mechanics of adhesive bonds. GRA

N85-19141# Illinois Univ., Urbana. Dept. of Ceramic Engineering.
EFFECT OF POWDER CHARACTERISTICS ON MICROSTRUCTURE AND PROPERTIES IN ALKOXIDE PREPARED PZT CERAMICS Final Report, 1 Dec. 1983 - 30 Nov. 1984
R. C. Buchanan and J. Boy Dec. 1984 38 p
(Contract N00014-80-K-0969)
(AD-A149082; TR-10) Avail: NTIS HC A03/MF A01 CSCL 11/2

Effects of coprecipitation parameters on agglomerate structure in PZT (53:47) powders prepared from butoxide precursors were studied. Results showed that differences in the agglomerate structures developed during coprecipitation persisted throughout the subsequent processing steps and the resulting sintered densities and microstructures to be correlated to the agglomerate structures. Coprecipitation parameters which most significantly affected the powder characteristics included temperature, dilution, pH, and hydrolysis rate (controlled by water concentration). Such processing parameters as powder rinsing, calcination temperature and spray-drying conditions also significantly influenced the developed microstructures. For equivalent processing conditions, most dense and uniform microstructures were developed with the softer (and smaller) agglomerate structures, achieved from an acid (pH 3.7) medium of low (3-5 vol%) solids content with rapid hydrolysis (about 32 ml water/min) and low temperature rise (10 to 15 C). Measured dielectric constants (700-1000) on the sintered PZT samples were found to increase with average grain size which typically were larger for the basic (pH 11) powders. GRA

N85-19142# Department of the Army, Washington, D. C.
POLYACTIC-POLYGLYCOLIC ACID COPOLYMER COMBINED WITH DECALCIFIED FREEZE-DRIED BONE FOR USE AS A BONE REPAIR MATERIAL Patent Application
J. P. Schmitz, inventor (to Army) Filed 9 Oct. 1984 17 p
(AD-D011438; US-Patent-Appl-SN-658945) Avail: NTIS HC A02/MF A01 CSCL 06/5

A novel bone repair material consisting essential of decalcified freeze-dried bone and biodegradable, biocompatible compolymer has been developed for improving and accelerating the healing of osseous tissue. The bone repair material was prepared by combining decalcified bone with a copolymer consisting essentially of a 50:50 poly(L)(-)lactide co-glycolide. GRA

N85-19143# Department of the Air Force, Washington, D.C.
METHOD FOR MAKING HETEROCYCLIC BLOCK COPOLYMERS Patent Application
T. T. Tsai, inventor (to Air Force) Filed 16 May 1984 13 p
(AD-D011446; US-Patent-Appl-SN-610912) Avail: NTIS HC A02/MF A01 CSCL 07/3

Thermally stable aromatic heterocyclic block copolymers are prepared by reacting a diamino monomer and terephthalic acid to form a carboxy-terminated rigid rod segment and then polymerizing a carboxy-monoamine monomer therewith to form flexible segments grafted onto the rigid rod segments. GRA

N85-19144# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
ON SHRINKAGE AND MOLECULAR EXTENSION
D. T. Grubb 20 Dec. 1984 13 p
(Contract N00014-83-K-0471)
(AD-A149100; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/4

When an oriented polymer is heated, it often retracts towards an isotropic state. The change in shape is a measure of the extension of the molecules in the oriented sample. The several different functions that have been used to define molecular extension are derived and reviewed. It is concluded that the ratio (oriented length/shrunk length) is the most appropriate, and that a direct test by neutron scattering would be feasible. GRA

N85-19145# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
CONDUCTION IN POLYMERIZED POLYFUNCTIONAL DIACETYLENES
R. P. Grasso, M. K. Thakur, and J. B. Lando 1 Dec. 1984 14 p
(Contract N00014-83-K-0246)
(AD-A149104; CWRU/DMS-TR-8) Avail: NTIS HC A02/MF A01 CSCL 11/9

The dimer of 1,11 dodecadiyne is representative of a family of diacetylene monomers which can be crystallized and then polymerized into semiconducting polymers. These materials possess sheet-like structures containing parallel polyacetylene and polydiacetylene chains bridged by methylene units. Polymeric forms

of these coupled diynes have also been prepared and crosspolymerized. Structural studies of these materials have been performed. The dimer 1,11 dodecadiyne was prepared in a unique manner which eliminates the possibility of contamination by oligomeric impurities that hinder crystallization. Microscopic single crystals of the dimer, obtained from hexane solution, were used in a structure analysis by electron diffraction. These results were compared to the structure of the fully polymerized crystal which was determined by X-ray analysis. GRA

N85-19146# Royal Aircraft Establishment, Farnborough (England).
POLYMER ELECTROLYTES: AN INVESTIGATION OF SOME POLY (N-PROPYLAZIRIDINE)/LITHIUM SALT COMPOSITIONS
K. R. Baldwin, A. J. Golder, and J. Knight Apr. 1984 26 p
(AD-A149444; RAE-TR-84036; DRIC-BR-93282) Avail: NTIS HC A03/MF A01 CSCL 07/4

Some poly(N-propylaziridine)/lithium salt compositions have been synthesized and their electrical conductivities have been measured in order to assess their suitability as electrolytes in safe, leakproof, high energy-density lithium batteries operating at ambient temperature. The effects on conductivity of temperature, and the nature and concentration of the salt have also been studied. The presence of the salts markedly improved the conductivity of the compositions over that of the undoped polymer but they were insufficiently conducting to be considered as battery electrolytes, due possibly to ion-pairing. Their creep resistance was also low. It was concluded that less fluid compositions containing higher molecular weight polymers better able to promote ion separation would be more suitable. GRA

N85-19147# California Univ., Berkeley. Electronics Research Lab.
SIMULATION OF THE ION-BEAM-DRIVEN DRIFT INSTABILITY IN A MAGNETIC TRAP, 1
V. A. Thomas, W. M. Nevins, and Y. J. Chen 13 Jun. 1984 71 p 2 Vol.
(Contract N00014-77-C-0578)
(AD-A149451; UCB/ERL-M84/45) Avail: NTIS HC A04/MF A01 CSCL 20/8

Recent experiments on the TMX-U device at LLNL have indicated the possibility of a drift wave being driven unstable by the injection of neutral beams in the thermal barrier region. A review of linear theory is presented in the local approximation. In addition, particle simulations are used to understand the nonlinear characteristics of this instability. The particle simulations are performed using 1d - 3v and 2d 3v electrostatic particle simulation codes. The instability is shown to saturate by beam trapping, nonlinear electron effects, and nonlinear motion parallel to the density gradient. Resonant ExB motion is a significant process for some of the beam particles. This process is closely associated with the trapping of beam ions. Harmonic generation is also observed, as appears in some of the experimental data. Qualitative nonlinear theory is presented in support of the particle simulations. GRA

N85-19148# McDonnell-Douglas Research Labs., St. Louis, Mo.
CHARACTERIZATION OF ACETYLENE-TERMINATED RESIN CURE STATES Interim Technical Report, 3 Mar. 1981 - 31 May 1983
A. C. Lind, T. C. Sandreczki, and R. L. Levy Wright-Patterson AFB, Ohio AFWAL 9 Aug. 1984 81 p
(Contract F33615-80-C-5170; AF Proj. 2303)
(AD-A149463; MDC-Q1212; AFWAL-TR-84-4075) Avail: NTIS HC A05/MF A01 CSCL 11/9

Acetylene-terminated oligomers are being considered for use in high-service-temperature adhesives and composites. It is thought that these resins cure via numerous pathways to produce different chemical structures such that the properties of the cured resin may be a strong function of the time-temperature cure schedule. Fourier transform infrared (FT IR), nuclear magnetic resonance (NMR), and electron paramagnetic resonance (EPR) experiments were performed to characterize the cure states of 4,4-bis(3-ethynylphenoxy)diphenyl-sulfone (ATS). Measurements were performed at selected times during isothermal cures at 403K, 423K, and 453K. Independent cure-state parameters were derived from IR absorbance changes, IR frequency shifts, H1 NMR relaxation times, C13 NMR magic-angle spinning spectral areas, and EPR-determined concentrations of free radicals produced during polymerization. Preliminary postcure studies were performed. GRA

N85-19149# Army Construction Engineering Research Lab., Champaign, Ill.
IMPROVED CERAMIC ANODES FOR CORROSION PROTECTION Final Report
J. H. Boy, M. Olson, V. Hock, and A. Kumar Nov. 1984 23 p
(AD-A149492; CERL-TR-M-85/02) Avail: NTIS HC A02/MF A01 CSCL 11/3

Ceramic anodes used for cathodic protection are currently made with expensive metals (niobium, tantalum) as substrates, and these anodes have a limited useful life. This study investigated plasma-sprayed ceramic coatings on aluminum and stainless steel substrates, as well as solid sintered ceramics, as less expensive and longer-lived alternatives. Anodes made of stainless steel substrates with an electroplated coating of a passive metal (tantalum) followed by a lithium-ferrite plasma-sprayed coating showed excellent promise. However, a triple layer plasma-sprayed coating system consisting of lithium ferrite over niobium over Ni-Cr-Al-Y sealcoat on 316L stainless steel and aluminum alloy substrates proved unacceptable as a possible anode material because of severe cracking and spalling. Solid sinter Mn and Mn-Zn ferrites also showed potential. They were fabricated with careful control of the postsintering cooling rate to yield materials with anodic dissolution rates less than 0.5 grams per amp year (g/A-yr). This is considerably improved from the 1 to 2 g/A-yr previously reported for plasma-sprayed lithium ferrite on a valve metal substrate. Donor doped and reduced solid sintered titanate compounds yielded electrically conductive materials, but they broke down so quickly and severely under anodic polarization testing that they are not suitable for cathodic protection applications. GRA

N85-19150# Illinois Univ., Urbana. Dept. of Ceramic Engineering.
DENSIFICATION OF SUBMICRON YSZ (YTTRIA-STABILIZED ZIRCONIA) POWDERS WITH ALUMINA AND BORATE ADDITIVES Final Technical Report, 1 Dec. 1983 - 30 Nov. 1984
R. C. Buchanan and D. M. Wilson 10 Dec. 1984 41 p
(Contract N00014-80-K-0969)
(AD-A149520; FTR-9) Avail: NTIS HC A03/MF A01 CSCL 11/2

Precipitated yttria (8.0 wt%) stabilized zirconia powders (YSZ) were sintered in the range 1150-1350 using Al2O3 and B2O3 as flux additions. A (2:1) Al2O3:B2O3 additive mixture at approximately 2 vol% concentration, gave significant densification when sintered at 1200 Cl/1 hr. Washing of the powders to remove residual Cl was necessary to achieve high densification below 1300 C. Samples obtained were optically translucent at 1 mm thickness with average grain size 0.2-0.4 micrometer. Mechanical, thermal and electrical properties were not degraded by the flux additions to YSZ. Densification by liquid phase sintering was determined for both B2O3 and Al2O3. Excess Al2O3 was found to exist as discrete particles in the YSZ matrix. Depletion of yttria from the grain matrix was observed with the flux additions but non-cubic phase transitions were not evident. GRA

N85-19151# Department of the Army, Washington, D. C.
SEALING ASSEMBLY Patent Application
H. H. Dobbs, inventor (to Army) Filed 12 Oct. 1984 8 p
(AD-D011463; US-Patent-Appl-SN-660574) Avail: NTIS HC A02/MF A01 CSCL 11/1

An improved sealing system is described for use in a sliding seal. The seal has a sliding member with first and second L-shaped seals and an annular opening. One L-shaped seal serves to seal junction of the annular opening with the sliding member and the second seal serves to seal the sliding member to the bore. Author (GRA)

N85-19152# Department of the Navy, Washington, D. C.
(VINYLOXY)CHLOROCYCLOTRIPHOSPHAZENES Patent Application
C. W. Allen, K. Ramachandran, R. Bright, and J. C. Shaw, inventors (to Navy) Filed 30 Apr. 1984 17 p
(AD-D011471; US-Patent-Appl-SN-605317) Avail: NTIS HC A02/MF A01 CSCL 07/3

The present invention allows one to incorporate the flame retardant property of the phosphazene into traditional commercial organic polymer. These flame retardants are chemically bonded to the polymer, rather than additives. GRA

N85-19153# Department of the Navy, Washington, D. C.
ADHESIVE JOINT FORMATION UNDER FIELD CONDITIONS Patent Application
L. H. Peebles, Jr., inventor (to Navy) Filed 30 Jul. 1984 20 p
(AD-D011478; US-Patent-Appl-SN-635866) Avail: NTIS HC A02/MF A01 CSCL 11/1

This invention relates to a method for effecting repairs of the damaged components of a machinery in the field which would otherwise require high temperature treatment of the damaged components to form a metal-oxide epoxy joint in a shop. The method includes preparing a repair patch which includes a metal sheet with the metal oxide layer thereon, applying a thin high performance protective coating thereover, covering thereof with a sacrificial backing sheet and then curing the adherent-top coat backing sheet to form a highly durable bonded system which can be stored until needed. At the time of repair the backing sheet is removed by sanding or grit blasting and the adherent is applied to the structure to be repaired under ordinary temperature conditions. GRA

N85-19154# Department of the Navy, Washington, D. C.
HOT ROLLING OF CERAMICS BY THE USE OF SELF PROPAGATING SYNTHESIS Patent Application
R. W. Rice, inventor (to Navy) Filed 19 Oct. 1984 21 p
(AD-D011486; US-Patent-Appl-SN-662933) Avail: NTIS HC A02/MF A01 CSCL 13/8

The present invention relates to the process of hot rolling of ceramics. More specifically, this invention involves the hot rolling of ceramics in conjunction with the self propagation synthesis process. A method for producing high technology ceramics with minimal porosity comprises the following steps: filling a can with a constituent powder of a ceramic; creating a vacuum in the can and maintaining the vacuum throughout the entire process; outgassing the powder in the can by placing a furnace around the area of the can that encloses the powder and heating the furnace to at least 100 C; removing the furnace after a minimum of five minutes of heating; cold rolling the can in a rolling system; igniting the powder so a localized propagation reaction front is created; and hot rolling the can in the rolling system so the propagation reaction front is maintained between the rolls of the rolling system. GRA

N85-19155# Los Alamos Scientific Lab., N. Mex.
EVALUATING THE VARIABILITY OF CERAMICS WITH X-RAY FLUORESCENCE
Patricia L. Crown (Arizona State Museum, Tucson), Larry A. Schwalbe, and J. Ronald London 1984 18 p refs Presented at the Advances in X-ray Analysis Conf., Denver, 30 Jul. 1984
(Contract W-7405-eng-36)
(DE85-002028; LA-UR-84-2975; CONF-840799-1) Avail: NTIS HC A02/MF A01

The assessment of prehistoric trade in ceramics depends on the ability to identify and distinguish different sources of manufacture. For the American Southwest, archaeologists have proposed various models of ceramic manufacture and exchange. Until recently, conflicting hypotheses were tested mainly on the basis of petrographic analysis of nonplastic tempering materials. These analyses are extended to include X-ray fluorescence (XRF). XRF provides a fast and inexpensive means of analyzing large numbers of samples. Since 1982, approximately 500 prehistoric sherds and 40 prepared clay and mineral samples have been examined with XRF. Multivariate statistical techniques have been applied to help identify groupings of samples with possible archaeological signiii-cance. DOE

N85-19156# Oak Ridge National Lab., Tenn.
AMORPHIZATION OF CERAMICS BY ION BEAMS
C. J. McHargue, G. C. Farlow, C. W. White, J. M. Williams, B. R. Appleton, and H. Naramoto 1984 16 p refs Presented at the Intern. Conf. on Surface Modification of Metals by Ion Beams, Heidelberg, 17 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000936; CONF-8409130-3) Avail: NTIS HC A02/MF A01

The influence of the implantation parameters fluence, substrate temperature, and chemical species on the formation of amorphous phases in Al2O3 and alpha-SiC was studied. At 300 K, fluences in excess of 10(17) ions/cm(2) were generally required to amorphize Al2O3. However, implantation of zirconium formed the amorphous phase at a fluence of 4 x 10(1) Zr/cm(2). At 77 K, the threshold fluence was lowered to about 2 x 10(15) Cr/cm(2). Single crystals of alpha-SiC were amorphized at 300 K by a fluence of 2 x 10(14) Cr/cm(2) or 1 x 10(15) N/cm(2). Implantation at 1023 K did not produce the amorphous phase in SiC. The micro-indentation hardness of the amorphous material was about 60% of that of the crystalline counterpart. DOE

N85-19157# Wisconsin Univ., Madison. Dept. of Chemical Engineering.
MICROSTRUCTURAL ANALYSIS OF ION CONTAINING POLYMERS Final Report, 1 Jul. 1981 - 30 Jun. 1984
S. L. Cooper Jul. 1984 32 p refs
(Contract DE-AC02-81ER-10922)
(DE85-001594; DOE/ER-10922/T1) Avail: NTIS HC A03/MF A01

The microstructure of several ionomer systems was investigated using techniques which probe different aspects of the structure. A liquid-like hard-sphere interparticle scattering model was proposed for the ionic domain morphology and has been shown to be superior to intra-particle scattering models in the literature. The result of applying this model to the experimental SAXS data implies that the ionic domain structure is determined by the polymer backbone and comonomer group anion but is independent of overall ion content, temperature and type of cation. EXAFS analysis has shown drastic differences in the local cation environment between monovalent alkali metal and divalent transition metal cations. More subtle differences were observed between cations in Nafion and hose in sulfonated polystyrene ionomers (SPS). Two well-ordered near-neighbor shells were evident for the Zn(2+) cations in SPS. A coordination structure based on the EXAFS data has been proposed for the Zinc-sulfonate groups in the SPS ionomer. This model is also consistent with the SAXS analysis. DOE

N85-19158# Wisconsin Univ., Madison. Dept. of Physics.
OPTICAL STUDIES OF DYNAMICAL PROCESSES IN DISORDERED MATERIALS Annual Progress Report, 1 Mar. 1984 - 28 Feb. 1985
W. M. Yen 1984 11 p refs
(Contract DE-AC02-83ER-45023)
(DE85-002400; DOE/ER-45023/2) Avail: NTIS HC A02/MF A01

A comprehensive study of processes which affect the relaxation and energy diffusion of optical energy residing in the impurity activated disordered insulators is discussed. Various non-radiative processes affecting the line widths of optical transitions and the general quantum efficiency of luminescent glasses are considered. Analyses of dynamical processes leading to energy transfer in rare earth-activated glases was begun. Exploratory studies of Cr(3+) in ceramics with respect to various dynamic interactions which impact on the efficiency of these materials were begun. DOE

N85-19159# Oak Ridge National Lab., Tenn.
MAGNETIC EXCITATION IN CuMn SPIN GLASS ALLOY
Y. Tsunoda, N. Kunitomi, and J. W. Cable Sep. 1984 13 p refs

Presented at at Magnetism and Magnetic Mater. Conf. and Exhibit, San Diego, Calif., 27 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-002564; CONF-841184-5) Avail: NTIS HC A02/MF A01

The spin dynamics of a spin glass alloy Cu78.7Mn21.3 were studied by neutron inelastic scattering. Measurements were made at 20 K, 150 K, and 290 K by the constant E mode of operation. Magnetic excitations with rather large energy transfer were observed around the (1 1/2 O) and the (1 1/2 + or - delta O) magnetic diffuse peak positions above and below the spin freezing temperature (T sub f approx. 90 K). The results indicate the existence of strong space and time correlations of the spins over the temperature range of the measurements. The experimental data are well explained by a model of dynamically fluctuating spin clusters with a broad distribution of relaxation times. DOE

N85-19160# Washington Univ., Seattle. Dept. of Chemistry.
POLYMERS AND MACROMOLECULES Final Technical Report, 15 Jun. 1981 - 14 Jun. 1984
B. E. Eichinger 1984 6 p
(Contract DE-AT06-81ER-10912)
(DE85-003176; DOE/ER-10912/T1) Avail: NTIS HC A02/MF A01

Work on random networks, polymeric chelates, and differential sorption is reported. The critical phenomenon of gelation and the theory of the shape distribution of macromolecules were also investigated. DOE

N85-19161# National Bureau of Standards, Gaithersburg, Md. Polymers Div.
CHARACTERIZATION OF POROSITY IN POROUS POLYMER IMPLANT MATERIALS Annual Report, Apr. - Sep. 1983
R. E. Dehl Sep. 1984 32 p refs Sponsored in part by National Center for Devices and Radiological Health
(PB85-119980; NBSIR-84/2883) Avail: NTIS HC A03/MF A01 CSCL 06B

The investigation of the methods of characterizing the porosity of two porous polymeric implant materials is discussed. The two materials, a porous polyethylene (PPE) and a porous composite of polytetrafluoroethylent and carbon (PTFE-C) were further investigated by the method of quantitative microscopy. The mean pore volume fractions of 30 samples each of PPE and PTFE-C were found to be 0.48 and 0.69, respectively, and are in good agreement with other measurements of this quantity. The mean intercept length for PPE was found to be 76 micrometers, and for PTFE-C, 67 micrometers. Both values are somewhat larger than the average interconnecting pore diameters as measured by mercury porosimetry. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-19162# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
THE 1984 JANNAF PROPULSION SYSTEMS HAZARDS SUBCOMMITTEE MEETING, VOLUME 1 Report, 16 Jul. 1983 - 20 Jun. 1984
Debra S. Eggleston, ed. Jun. 1984 145 p Meeting held at Aberdeen Proving Ground, Md., 18-20 Jun. 1984 2 Vol.
(Contract N00024-83-C-5301)
(AD-A148865; CPIA-Publ-409-Vol-1) Avail: Issuing Activity CSCL 21/9

This volume is the first of two volumes of the proceedings of the 1984 Joint Army-Navy-NASA-Air Force (JANNAF) Propulsion Systems Hazards Subcommittee Meeting, held 18-20 June 1984 at the Army Ballistic Research Laboratory, Aberdeen Proving Ground, Maryland. It contains twelve unclassified/unlimited-distribution papers on tactical and strategic missile hazards, including risk analysis of prematurely armed warheads, NATO and AGARD hazard programs, recovery of damaged propellants, DDT initiation mechanisms, and safety aspects of prepackaged liquid propellants for strategic missiles. For individual titles, see N85-19163 through N85-19174.

N85-19163# Naval Weapons Center, China Lake, Calif.
CALCULATION THROUGH FAULT TREE ANALYSIS OF THE PROBABILITY OF A WARHEAD BEING ARMED PRIOR TO LAUNCH
G. Stefan, Jr. and F. Spille *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 1-7 (For primary document see N85-19162 10-28)
(AD-P004339) Avail: Issuing Activity CSCL 12/1

This paper is presented to illustrate the usefulness of Fault Tree Analysis (FTA), which, when quantified can yield the probability of occurrence of a given undesired event. A Fault Tree is a symbolic logic diagram which provides the deductive analytical means to identify failure modes contributing to the occurrence of the undesired event. As an illustrative example, an analysis was performed to assess the design safety of the MK 76 MOD 0 Safety-Arming (S-A) device, which is used on Standard Missile SM-1 Block VI. This analysis was performed with the primary intent of determining the various scenarios leading to an armed prior to launch event. These scenarios are made possible only by the assumed failure, or assumed bypassing, of the safety interlocks in the S-A device. GRA

N85-19164# Naval Weapons Center, China Lake, Calif. Engineering Sciences Div.
REPORT ON AGARD MEETING: HAZARDS STUDIES FOR SOLID PROPELLANT ROCKET MOTORS
R. L. Derr and J. F. Kincaid (Kaman Sciences Corp., Arlington, Va.) *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 9-14 (For primary document see N85-19162 10-28)
(AD-P004340) Avail: Issuing Activity CSCL 21/8

In this meeting, technical interactions between AGARD and NATO standardization activities provided the basis for improved hazard methodologies to be used in the design of future solid propellant rocket motors. In addition, a basis was provided for new research and development topics to be addressed by the different NATO countries interested in the development, production, and sale of high energy solid rocket motors. The objectives of the meeting were achieved; however, it was agreed that all aspects of this subject could not be covered because of time limitations.
Author (GRA)

N85-19165# Naval Weapons Center, China Lake, Calif.
NATO AC/310 ACTIVITIES REPORT ON NATO STANAG 4170 AND ALLIED ORDNANCE PUBLICATION 7 (MANUAL OF TESTS FOR QUALIFICATION OF EXPLOSIVE MATERIALS FOR MILITARY USE)
M. E. Houser, O. Dengel, R. L. Beauregard (Naval Sea Systems Command, Washington, D.C.), A. Lusardi (Army Armament Munitions and Chemical Command, Dover, N.J.), and L. Avrami (Army Armament Munitions and Chemical Command, Dover, N.J.) *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 15-25 (For primary document see N85-19162 10-28)
(AD-P004341; AOP-7) Avail: Issuing Activity CSCL 19/1

The final draft of STANAG 4170 has been approved by NATO AC/310 Subgroup I (Explosives), and distributed to the participating NATO nations for ratification. The principles and methodology for the qualification of explosives, propellants, and pyrotechnics are described. The fifth draft of the AOP-7 Manual of Tests, which is the companion document to STANAG 4170, is being assembled. The principal features of assessment principles and methodologies, national qualification procedures, reference explosives, test information sheets, methods to record and issue

data, and the duties of National Authorities are described in detail. Author (GRA)

N85-19166# Hercules, Inc., Magna, Utah. Bacchus Works.
PREVENTING EXPLOSIVE PROPAGATION IN RACKS OR CONTAINERS OF TACTICAL MISSILES
R. B. Leining *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 27-36 (For primary document see N85-19162 10-28)
(AD-P004342) Avail: Issuing Activity CSCL 16/4

In racks or containers of tactical missiles, it is sometimes impractical to observe safe separations between adjacent missiles. The current expedient of alternating the directions of adjacent missiles to place their warheads radially out of line would fail if Class 1.1 rocket motors were introduced. Installing attenuators of blast and fragments between adjacent missiles could prevent propagation in the event of an explosive mishap. Conceptual designs are presented that could be retrofitted in some existing racks or containers. Weight of packaging per missile will increase significantly. This paper suggests some ways to reduce weight. Author (GRA)

N85-19167# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
RECOVERY OF DAMAGED SOLID PROPELLANTS BY INTERRUPTING BURNING AND CRACK-PROPAGATION PROCESSES
J. Mantzaras, E. Andiroglu, and K. K. Kuo *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 37-50 (For primary document see N85-19162 10-28)
(Contract N00014-79-C-0762)
(AD-P004343) Avail: Issuing Activity CSCL 21/9

Crack propagation in burning solid propellants and explosives can affect the performance of a rocket motor by increasing both the burning surface area and local pressurization rates. This may sometimes lead to deflagration-to-detonation transition (DDT) or detonation due to some unresolved mechanisms (XDT). In order to obtain direct evidence of structural damage of the propellant sample during crack propagation and branching, an interrupted burning experiment has been designed, constructed, and tested. Sample recovered from a preliminary test firing showed rough surface structure and several macrocracks in directions from the initial crack orientation. The propellant sample is believed to undergo significant cracking and branching before the extinction. This is supported by the experimental evidence of rough and cracked surfaces of the recovered sample, source-flow pattern observed from high-speed movie films, and extremely rapid pressurization of the source-flow region beyond the initial crack tip due to the fast burning of damaged propellant sample. Author (GRA)

N85-19168# New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.
ANTIPLANE CRACKS IN SOLID PROPELLANTS
F. D. Ju and J. J. Jacoby (LANL, N. Mex.) *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 51-59 (For primary document see N85-19162 10-28)
(Contract W-7405-eng-36)
(AD-P004344) Avail: Issuing Activity CSCL 21/9

This work investigates a mechanism for solid propellant hazard. That mechanism is a consequence of friction from a running antiplane crack propagating in its own plane. When a continuum that contains a crack is subjected to an applied load at some oblique angle to the face of the crack, then the load may be resolved into a shear stress and a normal stress. The normal stress causes friction at the crack surface that resists further growth of the crack while the shear stress provides the driving force for crack growth. It follows that for given crack characteristics and given load, the kinematics of the crack depend on the crack orientation with respect to the load. Continuous displacement in the antiplane direction will occur provided the shear stress is sufficient to cause the crack to grow. Under the conditions of continuous crack growth the friction energy will depend upon the normal pressure. There may exist combinations of applied load and crack orientations, that will lead to a deflagration to detonation transition of the propellant. Of fundamental importance is a stability criterion for a single crack, which is the subject of this paper. By making a number of simplifying assumptions it is possible to derive this stability criterion analytically. This result will subsequently be used to verify computer simulations before investigating more realistic material properties. Author (GRA)

N85-19169# Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
TRANSITION TO DETONATION FROM RAPID-COMPRESSION (RAMP-WAVES) GENERATED IN A BURNING POROUS BED
C. A. Cudak, H. Krier, and P. B. Butler *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 61-69 (For primary document see N85-19162 10-28)
(Grant AF-AFOSR-0145-81)
(AD-P004345) Avail: Issuing Activity CSCL 21/9

Increasing the nitramine content of solid rocket propellants increases the overall performance of the system as well as the sensitivity to detonation by shock initiation. In some instances a confined zone of granulated propellant adjacent to a zone of cast propellant can provide a rapid enough pressure-rise rate to shock initiate the cast material. If the cast propellant is porous, the detonation will initiate at some location ahead of the granulated bed/cast material interface. The work presented here is an effort to numerically model this Deflagration to Shock to Detonation Transition (DSDT) event. Results will be presented showing the detonation build up for propellant beds with various initial configurations and boundary conditions. Author (GRA)

N85-19170# Sandia Labs., Albuquerque, N. Mex. Fluid and Thermal Sciences Dept.
A THERMAL-MECHANICAL MODEL OF DEFLAGRATION-TO-DETONATION IN GRANULAR ENERGETIC MATERIALS
M. R. Baer, J. W. Nunziato, and R. J. Gross *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 71-79 (For primary document see N85-19162 10-28)
(Contract DE-AC04-76DP-00789)
(AD-P004346) Avail: Issuing Activity CSCL 12/1

In this work we present a multiphase, reactive flow model, based on the theory of mixtures and utilize it to describe deflagration-to-detonation transition in granular explosives and propellants. This nonequilibrium model treats each phase as fully compressible and incorporates a dynamic compaction model for the granular reactant. Formulation of the constitutive models include a pressure-dependent burn rate and experimentally-determined porous bed permeability. Numerical solutions of the one-dimensional Eulerian equations are obtained using an implicit method-of-lines solver. The model has examined two explosives: CP and HMX. Predictions with this model agree with existing experimental observations and demonstrate that a thermodynamically-consistent multiphase model can describe the flame-spread processes of convective burning and detonation. GRA

N85-19171# Hercules, Inc., Magna, Utah. Bacchus Works.
A SUMMARY OF THE MECHANISM OF DELAYED DETONATION
A. G. Butcher, K. P. McCarty, R. L. Keefe, and E. J. Bloomer *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 81-101 (For primary document see N85-19162 10-28)
(Contract N00030-82-C-0101)
(AD-P004347) Avail: Issuing Activity CSCL 19/4

For the past several years extensive studies have been conducted into the aspects of certain observed types of delayed detonation phenomena. These studies have been directed primarily to events preceding detonation as opposed to events after shock formation has occurred. The types of detonation transition which have been investigated are deflagration to detonation transition, DDT, and impact initiated delayed detonation, XDT. Most of the work has been published under the individual topics of XDT and DDT. This paper presents a summary of the work on both subjects

in an effort to show similarities in the basic behavior of delayed detonation. It references experimental results from XDT and DDT and ties these results together with respect ot the basic mechanisms leading to transition. Published work from several laboratories are referenced to broaden the data base of condition under which delayed detonation can occur. Author (GRA)

N85-19172# Ballistic Research Labs., Aberdeen Proving Ground, Md.

SOME ASPECTS OF THE MICROMECHANICS OF HOT SPOT FORMATION IN ENERGETIC MATERIALS

R. B. Frey *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 103-116 (For primary document see N85-19162 10-28)

(AD-P004348) Avail: Issuing Activity CSCL 19/1

We have studied the mechanics of cavity collapse in an energetic material. During cavity collapse, several mechanisms can act individually or collectively to produce high temperature hot spots. Our goal is to understand how pressurization rate, cavity size, and material parameters affect hot spot formation. For this purpose we have considered the collapse of spherical cavities using a modified form of the model of Carroll and Holt. Using this analysis, we can consider hot spots produced by plastic work, viscoplastic work, gas phase heating, or solid phase compression (which occurs as the result of high pressures produced when material collides at the center of the cavity). Under the proper conditions, each of these mechanisms may be dominant, but viscous heating is the most efficient mechanism and is dominant when the rise time of the pressure is short, viscosity is high, and/or yield stress is low. The conditions under which the other mechanisms are dominant and the dependence of hot spot temperatures on the pressurization rate, cavity size, and material properties are discussed. Author (GRA)

N85-19173# California Univ., Livermore. Lawrence Livermore Lab.

MEASUREMENT OF SHOCK INDUCED REACTION IN ROCKET PROPELLANTS BY NANOSECOND INFRARED RADIOMETRY AND PHOTOGRAPHY

W. G. VonHolle, J. Kury, E. James, and K. Scribner *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 117-125 Previously announced as N85-13070 (For primary document see N85-19162 10-28)

(Contract W-7405-eng-48)

(AD-P004349) Avail: Issuing Activity CSCL 21/9

This report examines shocked energetic materials with upgraded radiometers capable of 5 ns (5 x .000000005 sec) resolution. Shock-induced heating and reaction are now much better resolved, allowing much better characterization of distinct material shock responses. Initially various explosives and pressed inert powders were examined. Although this work is incomplete, enough has been done to make meaningful correlations and general conclusions about the mechanism of shock initiation. Several prototype propellants have thus far been examined. Tentative results based on the same analysis techniques used for the other materials indicate a completely different shock response. After a brief summary of the results and conclusions for explosives and pressed inerts, the latest results from the shocked prototype propellants will be presented, followed by some tentative conclusions based on a comparison with past propellant and the current explosives data. GRA

N85-19174# Rocketdyne, Canoga Park, Calif.

SAFETY ASPECTS OF PREPACKAGED LIQUID PROPELLANT STAGES FOR STRATEGIC MISSILES

C. J. Meisl and L. P. Combs *In* APL The 1984 JANNAF Propulsion Systems Hazards Subcomm. Meeting, Vol. 1 Jun. 1984 p 127-138 (For primary document see N85-19162 10-28)

(AD-P004350) Avail: Issuing Activity CSCL 13/12

This paper reviews the salient safety-relevant design and operational aspects of past and current small, prepackaged, storable liquid propellant missile stages such as Bullpup, Lance, Minuteman II Propulsion System Rocket Engine, and Peacekeeper Stage IV. The outstanding service record and safety experience during extensive ground transportation of full loaded stages, during many hours of storage and silo exposure, and in operational launches, are discussed in quantitative terms. Design and operational features responsible for this proven safety record are examined. These include propellant and pressurant isolation, tank and pressure vessel safety factors, ordnance features, external protection of propellant, stage size effects, and testing approach. Conclusions from the historical data are drawn as they apply to the design and operational approach of liquid propellant stages or velocity control systems for future strategic or tactical missiles. Author (GRA)

N85-19175*# General Electric Co., Lynn, Mass. Aircraft Engine Business Group.

ANALYTICAL FUEL PROPERTY EFFECTS: SMALL COMBUSTORS, PHASE 2 Final Report

T. G. Hill, J. D. Monty, and H. L. Morton Mar. 1985 45 p

(Contract NAS3-22829)

(NASA-CR-174848; NAS 1.26:174848; R85AEB014) Avail: NTIS HC A03/MF A01 CSCL 21D

The effects of non-standard aviation fuels on a typical small gas turbine combustor were studied and the effectiveness of design changes intended to counter the effects of these fuels was evaluated. The T700/CT7 turboprop engine family was chosen as being representative of the class of aircraft power plants desired for this study. Fuel properties, as specified by NASA, are characterized by low hydrogen content and high aromatics levels. No. 2 diesel fuel was also evaluated in this program. Results demonstrated the anticipated higher than normal smoke output and flame radiation intensity with resulting increased metal temperatures on the baseline T700 combustor. Three new designs were evaluated using the non standard fuels. The three designs incorporated enhanced cooling features and smoke reduction features. All three designs, when burning the broad specification fuels, exhibited metal temperatures at or below the baseline combustor temperatures on JP-5. Smoke levels were acceptable but higher than predicted. R.S.F.

N85-19176*# Lockheed-California Co., Burbank. Commercial Advanced Design Div.

STUDY OF ADVANCED FUEL SYSTEM CONCEPTS FOR COMMERCIAL AIRCRAFT AND ENGINES Final Report

E. F. Versaw, G. D. Brewer, W. D. Byers, H. W. Fogg, D. E. Hanks, and J. Chirivella (Ergo-Tech, Inc.) Jan. 1983 142 p refs

(Contract NAS3-23271)

(NASA-CR-174752; NAS 1.26:174752) Avail: NTIS HC A07/MF A01 CSCL 21D

The impact on a commercial transport aircraft of using fuels which have relaxed property limits relative to current commercial jet fuel was assessed. The methodology of the study is outlined, fuel properties are discussed, and the effect of the relaxation of fuel properties analyzed. Advanced fuel system component designs that permit the satisfactory use of fuel with the candidate relaxed properties in the subject aircraft are described. The two fuel properties considered in detail are freezing point and thermal stability. Three candidate fuel system concepts were selected and evaluated in terms of performance, cost, weight, safety, and maintainability. A fuel system that incorporates insulation and electrical heating elements on fuel tank lower surfaces was found to be most cost effective for the long term. R.S.F.

N85-19177# Ballistic Research Labs., Aberdeen Proving Ground, Md.

EFFECTS OF PERFORATION L/D RATIO AND SLOTTING ON STICK PROPELLANT COMBUSTION Final Technical Report, 1981 - 1983

A. A. Juhasz, F. W. Robbins, R. E. Bowman, J. O. Doali, and W. P. Aungst Oct. 1984 41 p

(DA Proj. 1L1-62618-AH-80)

(AD-A148854; AD-F300518; BRL-TR-2602) Avail: NTIS HC A03/MF A01 CSCL 19/1

Closed bomb combustion studies were performed on single-

perforated (1P) and slotted 1P NOSOL 363 propellant samples ranging in length from 19 to 338 mm. Samples having equal webs, but differing in their perforation diameters as well as lengths were examined. Samples with larger perforation diameters (PD) (2.13) showed an increase of observed burning rate with length. For example, at 200 MPa, the burning rate of the 338 mm samples was 17 percent greater than the burning rate of the 19 mm long samples. In the case of the samples with smaller (0.940 mm) perforation diameter, however, the fastest burning rates were observed for the medium length (168 mm) rather than the longest samples. All slotted and short granular propellant samples, irrespective of perforation diameter, exhibited essentially identical burning rate characteristics. The studies indicate that, at least under closed bomb conditions, slotted 1P stick propellants burn just like granular propellants. In the case of unslotted 1P stick propellants, however, complex burning augmentation effects exist. Some of the mechanisms may involve increases in the burning rate inside the perforations due to enhanced pressure and/or erosive burning effects as well as grain splitting. Modeling propellant burning via the grain splitting and pressure build up hypotheses was partially successful in accounting for the observed effects.

GRA

N85-19178# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.

FUELS COMBUSTION RESEARCH Annual Report, 1 Mar. 1983 - 29 Feb. 1984

F. L. Dryer, I. Glassman, and F. A. Williams 18 Jul. 1984 52 p

(Contract F49620-82-K-0011)

(AD-A149106; MAE-1668; AFOSR-84-1167TR) Avail: NTIS HC A04/MF A01 CSCL 21/2

Further oxidation studies of the n-alkylated aromatics reveal insights with respect to the oxidation of the alkyl side chains. Toluene is unique in its oxidation due to the nonreactivity of the benzyl radical that forms. The higher normal alkyl aromatics all form styrene and alkyl radicals during the initial stages of oxidation. Thus the oxidation of these fuels will all be similar to ethyl benzene. The first results on the oxidation 1-methyl naphthalene have been obtained. A study on the oxidation and pyrolysis of butadiene, an important aromatic intermediate and soot precursor, has been completed. More extensive experimentation on the sooting tendencies in premixed and diffusion flames has been performed. The new fuels used were the cycloalkanes, the cycloolefins, purified 1,3-butadiene and 1-methyl naphthalene. A new model for sooting under premixed conditions reveals that original fuel structure does not play a role in soot production, but the number of carbon-carbon bonds in the fuel do. Diffusion flame results confirm that fuel pyrolysis rates and intermediates determine the sooting tendency in this combustion system. The new theory of boron ignition and combustion has been improved further. Appropriate droplet generators for boron and carbon slurries have been developed.

GRA

N85-19179# United Technologies Research Center, East Hartford, Conn.

INVESTIGATION OF FUEL ADDITIVE EFFECTS ON SOOTING FLAMES Annual Scientific Report, 1 May 1983 - 30 May 1984

P. A. Bonczyk 25 May 1984 17 p

(Contract F49620-83-C-0113)

(AD-A149154; UTRC/R84-956545; AFOSR-84-1168TR) Avail: NTIS HC A02/MF A01 CSCL 21/4

Experiments in progress are described which have as their objective the clarification of the mechanisms responsible for soot suppression in flames by fuel additives. Measurements have been carried out in small well-defined diffusion flames for both gaseous and liquid fuels. Data have been obtained for selected organic and inorganic compounds of Ba, Fe, K and Mn as additives. The experimental techniques either employed or projected for use in the near term are in-situ by virtue of their reliance on nonperturbing laser-optical diagnostics. These techniques are Mie scattering, laser-induced fluorescence and coherent anti-Stokes Raman scattering to measure soot size and concentration, additive and other species concentrations and flame temperature, respectively. For gaseous fuels, inorganic salts of the above metals have been evaluated as additives in an ethylene/air flame. Additive suppression of soot was demonstrated, and particulate size, concentration and volume fraction were measured throughout the flame. Significantly, additive effectiveness varied with measurement position, and dissimilar metal behaved differently with respect to their alteration of soot parameters. In addition to particulate measurements, Ba additive chemical states in the flame have been identified from their optical emission spectra, and laser-induced fluorescence measurement has been demonstrated for a molecule closely identified with one of the latter states. For liquid fuels, ferrocene (dicyclopentadienyl iron) has been evaluated as an additive in wick and cylindrical counterflow diffusion flames.

Author (GRA)

N85-19180# Illinois Univ., Urbana-Champaign. Dept. of Mechanical and Industrial Engineering.

ANALYSIS OF SHOCK TO DETONATION TRANSITION (SDT) OF POROUS HIGH ENERGY PROPELLANT FROM RAMP-WAVE COMPRESSION LOADING Annual Technical Report, 10 Jan. 1983 - 10 Sep. 1984

H. Krier and C. A. Cudak Sep. 1984 121 p

(Grant AF-AFOSR-0145-81)

(AD-A149333; UILU-ENG-84-4007; AFOSR-84-1105TR) Avail: NTIS HC A06/MF A01 CSCL 21/9

Increasing the nitramine content of solid rocket propellants increases the overall performance of the system as well as the sensitivity to detonation by shock initiation. In some instances a confined zone of granulated propellant adjacent to a zone of cast propellant can provide a rapid enough pressure-rise rate to shock initiate the cast material. If the cast propellant is porous, the detonation will initiate at some location ahead of the granulated bed/cast material interface. The work presented here is an effort to numerically model this Deflagration to Shock to Detonation Transition event. Results are presented showing the detonation build up for propellants/explosives with various initial void content and ramp wave compression loads. Author (GRA)

N85-19181# Texas Univ. at Dallas, Richardson.

EXCIPLEX SYSTEMS FOR VAPOR-LIQUID VISUALIZATION OF FUEL SPRAYS Final Report, 1 Sep. 1983 - 31 Aug. 1984

L. A. Melton and A. M. Murray 1984 72 p

(Grant AF-AFOSR-0307-83)

(AD-A149360; UTD-CHEM-8401; AFOSR-84-1170TR) Avail: NTIS HC A04/MF A01 CSCL 21/4

The University of Texas at Dallas has conducted research on potential new organic exciplex systems for use in fluorescent visualization of the vapor and liquid portions of evaporating fuel sprays. These exciplex systems represent a novel and potentially powerful diagnostic tool for the analysis of the vaporization processes in gas turbine fuel sprays, and as such possess considerable relevance to Air Force propulsion needs. This final report describes the five best exciplex systems developed to date, the methods used to screen nearly one hundred of potential systems, and the characterization of the naphthalene/tetramethyl-p-phenylene diamine system. This last system has already been used in demonstration experiments to photograph the separate liquid and vapor patterns in an evaporating fuel spray. GRA

N85-19182# Arkansas Univ., Fayetteville.

A REVIEW OF HAZARD ASSESSMENT PROCEDURES FOR LIQUID GUN PROPELLANTS

J. A. Havens Nov. 1984 86 p

(DA Proj. 1L1-62618-AH-80)

(AD-A149470; AD-F300541; BRL-CR-537) Avail: NTIS HC A05/MF A01 CSCL 19/1

Safety testing procedures for energetic liquids are reviewed. A rationale for development of a protocol for safety testing of liquid gun propellants is suggested. A compilation of safety test data for gun propellants, along with comparison data for explosives and rocket propellants, is presented. Applicability of test methods developed primarily for explosives and high energy rocket propellants to the assessment of hazards that may be encountered

in handling, storage, and transportation of gun propellants is considered. Test procedures which should be further evaluated are identified. In general, the data available on the response of liquid gun propellants to these test procedures are not sufficient for a thorough evaluation of the tests' usefulness for assessing liquid gun propellant hazards. Additional work is recommended to provide test data which can be used to compare the response of gun propellants with other energetic liquids for which there is an extensive safety experience data base. Further work is also recommended to characterize the energy input and boundary conditions for the selected test procedures to provide a means for evaluating the tests with respect to severity and correspondence to conditions which may be encountered in handling, storage, and transportation. GRA

N85-19183# Department of the Army, Washington, D. C.
CURVILINEAR SOLID PROPELLANT GRAIN Patent Application
B. F. Wilson, inventor (to Army) Filed 1 Nov. 1984 6 p
(AD-D011457; US-Patent-Appl-SN-667315) Avail: NTIS HC A02/MF A01 CSCL 21/9

A curvilinear solid propellant gas generator is described which includes a housing that has a diameter or width that is larger than the length of the gas generator and with a curvilinear solid propellant grain mounted therein to provide a long burning time propellant with a short length housing. Author (GRA)

N85-19184# California Univ., Livermore. Lawrence Livermore Lab.
EXPERIMENTAL HIGH PRESSURE EQUATION OF STATE OF A VERY FAST BURNING GUN PROPELLANT
M. Costantino and D. Ornellas Sep. 1984 24 p refs Presented at JANNAF Combust. Meeting, Laurel, Md., 1-5 Oct. 1984 Submitted for publication
(Contract W-7405-eng-48)
(DE85-001749; UCRL-91565; Conf-8410149-1) Avail: NTIS HC A02/MF A01

Experimental data are presented on the pressure-volume, compressional and shear wave speeds, and failure strength of an 88% TMD, very fast burning gun propellant. The measurements are carried out in the range 0.1 to 400 MPa at a stress rate of 0.1 MPa/s and at room temperature. The mechanical EOS is dominated by the elastic-plastic response of the pore structure, although precise analysis is complicated by viscoelastic effects with time constants comparable to experimental times. These measurements represent some of very few experimental data available for constitutive relations, and the need for other laboratories to undertake similar experiments is emphasized. DOE

N85-19185*# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mechanical Engineering.
KNOCK SYNDROME: ITS CURES AND ITS VICTIMS
A. K. Oppenheim Jul. 1984 11 p refs Presented at the SAE Fuels and Lubricants Meeting, Baltimore, 8 Oct. 1984
(Grants NAG3-133; NAG3-137; Contract DE-AC03-76SF-00098; Grant NSF CPF-81-15163)
(NASA-CR-174395; DE84-016884; LBL-18163; CONF-8410138-1; NAS 1.26:174395) Avail: NTIS HC A02/MF A01 CSCL 21D

The knock phenomenon imposes a major technological constraint upon the automotive and oil industries; its various cures are reviewed. Essential features of combustion instability leading to its onset are exposed, and the methodology is outlined for a rational attack upon the problem it poses. Three different cures for solving the problem are proposed: (1) development of mechanical design for the combustion chamber; (2) alteration of chemical composition of fuel; and (3) mechanical-kinetic development of direct control of the combustion process. DOE

N85-19186# California Univ., Livermore. Lawrence Livermore Lab.
NUMERICAL SIMULATIONS OF LIQUID PROPELLANT COMBUSTION INSTABILITY: ONSET AND GROWTH
Alfred C. Buckingham Sep. 1984 12 p refs Presented at the 3rd Intern. Gun Propellant Symp., Dover, N.J., 29 Oct. - 2 Nov. 1984
(Contract W-7405-eng-48)
(DE85-000743; UCRL-90775; CONF-8410155-1) Avail: NTIS HC A02/MF A01

This work describes the onset and evolution of instabilities initiated at a liquid phase (reactant) gas phase (product) interface which is considered initially wrinkled by a prescribed surface perturbation. Combustion generates the vapor product region, raises its pressure, and accelerates it into the liquid fuel region, initiating Rayleigh-Taylor instabilities. The original Rayleigh-Taylor interface instabilities and subsequent, parasitic Kelvin-Helmholtz instabilities are investigated during their growth over a range of idealized initial conditions representative of liquid propellant driven gun combustion. Phase change and interphase heat and mass transfer are neglected in this study, so that combustion energy release is simulated solely by pressure rise in the gas phase. This permits a detailed study of the hydrodynamic instability growth at the fuel/gas interface through use of a Lagrangian center of mass formalism. The variable density field is thereby traced explicitly in space and time following the moving Lagrange contours. The bands of nearly constant density bounded by two successive Lagrange lines are, however, Eulerian representations with the spanwise velocity distribution defined on a fixed grid of spatial solution points. DOE

N85-19187# Department of Energy, Pittsburgh, Pa. Energy Technology Center.
CATALYTIC CONVERSION OF C3-C4 PARAFFINS TO GASOLINE
R. F. Batchelder, H. W. Pennline, R. R. Schehl, and D. H. Finseth Dec. 1984 40 p refs
(DE85-004181; DOE/PETC-TR-85/2) Avail: NTIS HC A03/MF A01

The reaction of propane and butane to form gasoline range hydrocarbons in a single step catalytic process was investigated in a tubular packed bed reactor maintained at near isothermal conditions. Three catalyst systems were studied: a zeolite, ZSM-5; a dehydrogenation catalyst, chromia-alumina; and a 50:50 mixture by weight of the previous two catalysts. It was found that ZSM-5 alone converts propane or butane to gasoline range products over a temperature range of 350 to 540 C. The reaction of butane over ZSM-5 results in a large selectivity to propane depending on the temperature. The addition of chromia-alumina to ZSM-5 increased the first order rate constant for butane conversion by 60% at 450 C. The addition of chromia-alumina to ZSM-5 also increased the C sub 5+ selectivity for butane conversion by 30% at 540 C. The addition of chromia-alumina to ZSM-5 had little effect on the rate of propane conversion, but it did increase the C sub 5+ selectivity for propane conversion by over 100% at 540 C. R.S.F.

N85-19188# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
DISSOCIATED METHANOL CITATION Final Report
Joseph G. Finegold, Gerard P. Glinsky, and Gerald E. Voecks (JPL) Aug. 1984 259 p refs
(Contract DE-AC02-83CH-10093)
(DE85-000505; SERI/TR-235-2083) Avail: NTIS HC A12/MF A01

A system to vaporize and dissociate methanol onboard an automobile was designed. It was integrated with a 2.5 liter, 4-cylinder engine for testing on an engine dynamometer. Engine dynamometer tests showed significant thermal efficiency advantage over gasoline at all speed-load points. At low speed and light load, the fuel economy improvements were largest. Fuel economies. of 13.3 km/L and 11.4 km/L were obtained at steady speed road load conditions of 65 km/h and 90 km/h, respectively. Methanol fuel economy over the EPA highway fuel economy test was 10.2 km/L. It is concluded that the dissociation of methanol on board a vehicle is technically feasible. Tests of the first prototype show large improvements in energy economy relative to gasoline. DOE

N85-19189# Southwest Research Inst., San Antonio, Tex.
VOLATILITY OF IN-USE GASOLINE AND GASOLINE-METHANOL BLENDS Final Report, 29 Feb. - 28 Sep. 1984
Charles M. Urban Sep. 1984 42 p
(Contract EPA-68-03-3162)
(PB85-117976; EPA/460-3-84-009) Avail: NTIS
HC A03/MF A01 CSCL 21D

Results of analyses for alcohol content, volatility, and other properties of forty in-use unleaded gasoline samples are presented. Analyses conducted on these fuels included: methanol, ethanol, and tertiary butyl alcohol (TBA) quantitation; Reid vapor pressure; distillation; water and lead content; and the calculation of FEVI and EI volatility indices. Twenty-two of the forty samples contained between three and five percent methanol. Most of the gasoline samples, including those not containing methanol, contained several percent TBA. Data obtained indicated the volatility of fuels containing methanol and TBA were not significantly different from that of fuels containing only TBA. The data also showed an average RVP of 13.3 and 13.6 psi respectively for these fuels, which, is above the maximum ASTM specified RVP of 11.5 psi for the Houston area at the time these samples were taken. GRA

N85-19190# Polytechnic Inst. of New York, Brooklyn.
ALTERNATIVE FUELS FOR BUSES: CURRENT ASSESSMENT AND FUTURE PERSPECTIVES Final Report
Arnold J. Bloch May 1984 68 p refs
(Grant DOT-UMTA-NY-11-0023)
(PB85-116325; UMTA-NY-11-0023-84-2) Avail: NTIS
HC A04/MF A01 CSCL 21D

The limited research that conducted regarding alternative fuels for buses is summarized. Results are matched with relevant objectives, and recommendations for further research and policy directions are given. The issue of alternative fuels for transit buses is examined from the perspective of the 1980s and beyond. It is pointed out that in a time when Federal involvement in alternative fuel development is of lessened significance and market place actions seem of greater value than government intervention or investment, it is relevant to examine the objectives of developing diesel fuel alternatives for public transportation vehicle use. Five fuels were named as possible alternative fuels for bus transit systems: methanol; ethanol; vegetable oils; methane; and hydrogen. GRA

N85-19191# Engineering-Science, Inc., Fairfax, Va.
TEST REPORT FOR GETTY SYNTHETIC FUELS, INC., CALUMET CITY, ILLINOIS Final Report
May 1984 170 p
(Contract EPA-68-01-6312)
(PB85-119493; EPA/905-2-84-003) Avail: NTIS
HC A08/MF A01 CSCL 07D

The Getty Synthetic Fuels, Incorporated, landfill gas processor located at C.I.D., Chicago, Illinois, was sampled for organic compounds from three gas streams the inlet gas off the landfill, the discharge to the pipeline distribution system and an ambient vent. A liquid stream was also sampled and analyzed for certain metals as well as the organic compounds. Test results indicate the presence in low levels of many of the compounds presently being investigated as hazardous substances. However, it was determined that the sale gas was relatively clean with respect to the inlet gas. It was concluded that the condensate system is an effective hydrocarbon removal process. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-19192# National Bureau of Standards, Washington, D.C.
THE DEVELOPMENT OF FIRE EVALUATION SYSTEM FOR DETENTION AND CORRECTIONAL OCCUPANCIES
H. E. Nelson and A. J. Shibe Dec. 1984 122 p refs Sponsored by National Institute of Justice
(NBSIR-84/2976) Avail: NTIS HC A06/MF A01

A fire safety evaluation system for detention and correctional occupancies was developed. It can be used for determining if a facility has fire safety equivalent to that obtained by meeting the requirement of a given code. The system was calibrated for use with proposed chapters for detention and correctional occupancies of the Life Safety Code (1985). There are separate sets of requirements for each of four use conditions: one for zoned egress, one for zoned impeded egress, one for impeded egress, and one for contained. Within each set, there are two levels of evaluation: one for partially sprinklered and nonsprinklered buildings, and one for totally sprinklered buildings. Author

N85-19193# Department of the Army, Washington, D. C.
ADJUSTMENT STRUCTURE Patent Application
E. J. Roznieckl, inventor (to Army) Filed 9 Nov. 1984 10 p
(AD-D011461; US-Patent-Appl-SN-669911) Avail: NTIS
HC A02/MF A01 CSCL 13/9

An adjustment mechanism is described for adjusting the relative position of at least two parts. A first movable member has two bores formed therein with a frusto-conical portion formed at one end of the bores. A second fixed member has a pair of threaded apertures formed therein. The apertures in the fixed member have a distance between their axes less than the distance between the axes of the bores. Threaded cams are disposed within the bores and apertures to that rotation of the threaded cams caused an adjustment force to be applied to the movable member.
Author (GRA)

N85-19194# Department of the Navy, Washington, D. C.
COMPOSITION AND METHOD FOR CLEANING EMBEDDED SOIL FROM SURFACES HAVING LOW GLOSS COATINGS Patent Application
K. G. Clark, inventor (to Navy) Filed 11 Apr. 1984 7 p
(AD-D011465; US-Patent-Appl-SN-600876) Avail: NTIS
HC A02/MF A01 CSCL 11/11

A composition for cleaning embedded soil from surfaces coated with flat or low-gloss coatings has elastomeric particles intermixed with a thixotropic solvent emulsion cleaner. The elastomeric particles provide an eraser-like action to absorb deeply entrapped soil so that the cleaner can emulsify or dissolve the soil and wash it away. GRA

N85-19195# Department of the Air Force, Washington, D.C.
METHOD FOR CONTINUOUSLY CASTING Patent Application
S. J. Savage, inventor (to Air Force) Filed 16 Nov. 1984 14 p
(AD-D011481; US-Patent-Appl-SN-672237) Avail: NTIS
HC A02/MF A01 CSCL 13/8

A process and apparatus for continuously casting a castable material to a thickness of 10 to 40 mils is discussed. A molten material is first spread onto a spreading roller to a uniform thickness and then transferred to a quenching roller whereon the material is cooled until dimensionally stable. The apparatus may be employed to continuously cast thin sheet, platelets, wire, etc. The materials castable by this process and apparatus include metals, alloys, glasses, thermoplastic materials and metalloids.
GRA

N85-19196# Department of the Air Force, Washington, D.C.
DOUBLE PINCH-PUSH CONTACT INSERTION END-EFFECTOR Patent Application
M. Weixel, inventor (to Air Force) Filed 27 Nov. 1984 14 p
(AD-D011485; US-Patent-Appl-SN-675173) Avail: NTIS
HC A02/MF A01 CSCL 13/9

This invention relates to robotic assembly of wire harnesses, and, more particularly, to a contact-independent double pinch-push contact insertion end-effector for use in wire harness assembly. The end-effector comprises a front jaw assembly which is moveable relative to a rear jaw assembly. Each jaw assembly comprises a pair of jaws, where each pair is individually actuable to effect contact insertion. GRA

N85-19197# Oak Ridge National Lab., Tenn.
DOE/ORNL ELECTRIC SYSTEMS PROGRAM OVERVIEW
P. D. Fairchild 1984 15 p refs Presented at the DOE/ORNL Heat Pump Conf., Washington, D.C., 10 Dec. 1984
(Contract DE-AC05-84OR-21400)
(DE85-003334; CONF-841231-2) Avail: NTIS HC A02/MF A01

Major projects in electric systems program include two experiments, one laboratory study, one data survey and an analysis effort. The TECH site work has focused on state-of-the-art (SOA) single speed residential air-to-air heat pumps for the past few years, but is currently changing to a SOA two speed unit. The preprototype dual stroke advanced heat pump was developed and is tested. The laboratory study is aimed at detailed measurement of refrigerant migration with varying on off cycles, frost formation with varying relative humidities, and other such factors to develop an understanding of effect and cause of dynamic losses. The field performance data survey is a project to determine the extent and quality of data that are available on heat pump field performance from manufacturers, utilities, and others. DOE

N85-19198# National Inst. for Occupational Safety and Health, Cincinnati, Ohio. Engineering Control Technology Branch.
CONTROL TECHNOLOGY FOR FIBER REINFORCED PLASTICS INDUSTRY AT AMF HATTERAS YACHTS, NEW BERN DIVISION, NEW BERN, NORTH CAROLINA
William F. Todd 25 May 1984 42 p
(PB85-109015; CT-107-22A) Avail: NTIS HC A03/MF A01 CSCL 06J

Area and breathing zone samples were analyzed for styrene (100425) at AMF Hatteras Yachts (SIC-3079), New Bern, North Carolina, in September, 1983. Control technology at the facility was inspected. Breathing zone styrene concentrations were 8 to 74 parts per million (ppm), the highest concentrations occurring in the lamination and gel coating departments. Area samples ranged from 1 to 20ppm. The OSHA standard is 100ppm. The hull lamination and assembly areas were ventilated by air make up units and exhaust blowers. Air exhausted through the lamination booths in the small parts work area was considerably less than the supply air from the make up units. The air flow in two of the three lamination booths was considered inadequate. Respirators were available if needed. Industrial hygiene sampling at the facility was supervised by the industrial hygienist. GRA

N85-19199# National Academy of Sciences - National Research Council, Washington, D. C.
ICE SEGREGATION AND FROST HEAVING Final Report
1984 84 p ref
(Contract DAAG29-81-K-0163)
(PB85-122430) Avail: NTIS HC A05/MF A01 CSCL 08L

Major engineering projects have focused attention on problems created by the freezing of water in earth materials. The problems arise from the tendency of ice to form in lenses segregrated from the surrounding soil. As these lenses grow, they are capable of generating large pressures that disturb the surface of the ground. The term frost heaving is used to describe this phenomenon. The report summarizes the current state of knowledge and areas of controversy or uncertainty that additional research might resolve. GRA

N85-19200# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
15 Feb. 1985 52 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-008) Avail: NTIS HC A04/MF A01

News items, abstracts and scientific reports on aspects of science and technology including biotechnology, engineering products, machine tools, stress analysis of heavy metal plates, and flame-spread properties of paints are described. For individual titles, see N85-19201 through N85-19203.

N85-19201# Joint Publications Research Service, Arlington, Va.
TECHNICAL DATA ON NEW ENGINEERING PRODUCTS
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-008) 15 Feb. 1985 p 11-19 Repr. from Polish Eng. (Warsaw), no. 4, 1984 p 29-33 (For primary document see N85-19200 10-31)
Avail: NTIS HC A04/MF A01

New grades of permanently magnetic materials; automatic digital radiolocator; bench winder; analog induction gauge; programmable pulse generator; portable defibrillators; pipe welders; two-component electromagnetic log; sulphur content analyzer; peristaltic pumps; function generators; welding manipulator; and tonsiometer are described. B.G.

N85-19202# Joint Publications Research Service, Arlington, Va.
NATIONAL MACHINE TOOLS CONFERENCE SLATED FOR 1985: CONFERENCE AGENDA, PAPERS c37
L. T. Wrotny *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-008) 15 Feb. 1985 p 20-39 refs Transl. into ENGLISH from Mech. (Warsaw), no. 6, 1984 p 286 (For primary document see N85-19200 10-31)
Avail: NTIS HC A04/MF A01

The development of the production of machining centers still does not occupy its proper place at machine tool enterprises. The causes responsible for this situation are discussed. B.G.

N85-19203# Joint Publications Research Service, Arlington, Va.
METHODOLOGY FOR STRESS ANALYSIS OF HEAVY METAL PLATE c39
Marian Kmiecik and Alfred Jazukiewicz *In its* East Europe Rept.: Sci and Technol. (JPRS-ESA-85-008) 15 Feb. 1985 p 40-46 refs Repr. from Budownictwo Okretowe (Warsaw), no. 10, 1984 p 4-5, 407 (For primary document see N85-19200 10-31)
Avail: NTIS HC A04/MF A01

The calculation results of the load-carrying capacity of plates having initial deflections and stresses are presented. The calculations were carried out with the PLAMES computer program. Square and rectangular plates with simply supported and rigidly fixed edges were tested along with those with restrained and unrestrained edges of their middle planes. B.G.

N85-19204# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
30 Jan. 1985 73 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-004) Avail: NTIS HC A04/MF A01

News items, abstracts, and scientific reports on aspects of science and technology including aerospace engineering, automobile industry, computers, microelectronics, biotechnology, and technology transfer are described. For individual titles, see N85-19205 through N85-19210.

N85-19205# Joint Publications Research Service, Arlington, Va.
COMMERCIAL SPACE: EUROPE SHOULD HAVE INDEPENDENT STRATEGY c12
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 1-5 Transl. into ENGLISH from Aarde and Kosmos (Netherlands), Nov. - Dec. 1984 p 518-522 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

The impact of space commercialization on Europe is discussed. Advantages and disadvantages are discussed with emphasis on the following areas: competition, legal liabilities, economics, and development of European spacecraft. B.G.

N85-19206# Joint Publications Research Service, Arlington, Va.
BRITISH AEROSPACE STUDIES HOTOL SATELLITE LAUNCHER c18
In its West Europe Rept.: Sci. and Technol. (JPRS-WT-85-004) 30 Jan. 1985 p 6-8 Transl. into ENGLISH from Aarde and Kosmos (Netherlands), Nov. - Dec. 1984 p 536 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

The design and functions of the HOrizontal Take-Off-and-Land (HOTOL) satellite launcher are discussed. B.G.

N85-19207# Joint Publications Research Service, Arlington, Va.
RESEARCHERS, PROJECTS AT FRENCH INTELLIGENT MA-

CHINE CENTER c60
Xavier Dalloz *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 43-46 Transl. into ENGLISH from Minis et Micros (Paris), 24 Sep. 1984 p 39-40 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

The activities of the Intelligent-Machine Research Institute are summarized. The following topics are included: artificial intelligence; very large scale integration; speech recognition; speech perception; encoding; phonetics; algorithms; optical reading; neuronics; visual perception; and geometric modeling. B.G.

N85-19208# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM DEVELOPS 2D, 3D COMPUTER VISION SYSTEM c60
Rosalie Hurtado *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 47-52 Transl. into ENGLISH from Minis et Micros (Paris), 24 Sep. 1984 p 41-43 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

The computer vision prototype developed by the ENSERG (National Advanced School for Electronics and Radioelectronics) was adapted for industry. The objective of the system is to extract the contours of an object in real time. To increase the visual perception capacity of a robot, a helium-neon laser equipped with a cylindrical lens producing a light plane was added to the system. B.G.

N85-19209# Joint Publications Research Service, Arlington, Va.
SIEMENS' CAD SYSTEM DESIGNS VLSI CIRCUITS c61
Berthold Koch and Martin Nett *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 52-55 Repr. from Data Rept. (Munich), Sep. 1984 p 18; 20-21 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

The pace of development in the computer field is largely set by progress in semiconductor technology, which has led to the production of LSI and VLSI circuits. The ever-increasing complexity both of computers themselves and of the chips from which they are constructed means that it is essential to develop new design methods and production techniques to reduce development time and increase design reliability. New methods and tools are available to the system developer in the form of a VLSI-CAD system: the circuit design system VENUS is used for the design and simulation of, and the preparation of test program for, VLSI circuits. Author

N85-19210# Joint Publications Research Service, Arlington, Va.
FRENCH COMMENTARY ON SOVIET INDUSTRIAL ESPIONAGE c85
Christian David and Jean Gloaguen *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 61-69 Transl. into ENGLISH from Le Nouvel Econ. (Paris), 3 Dec. 1984 p 60-65 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

France continues to be the victim of intense industrial espionage whose targets have ranged from the Concorde supersonic transport to Cabasse high-fidelity speakers, from top secret nuclear fusion research to the latest discoveries in underwater acoustics. Security measures enacted by France are discussed, along with listings of the agencies involved with the Soviet industrial espionage system. B.G.

N85-19211# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MACHINE TOOLS AND METALWORKING EQUIPMENT
12 Feb. 1985 51 p Transl. into ENGLISH from various Russian articles
(JPRS-UMM-85-003) Avail: NTIS HC A04

News items, abstracts and scientific reports on aspects of machine tools and metal working equipment including industry planning and economics, robotics, automated lines and aggregated machining systems, process control and automation electronics, and technology planning and management automation are described. For individual titles, see N85-19212 through N85-19219.

N85-19212# Joint Publications Research Service, Arlington, Va.
ARMENIA MARKETS NEW DRIVE MOTORS FOR MACHINE TOOLS c37
K. Firsov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 4-5 Transl. into ENGLISH from Kom. (USSR), 9 Sep. 1984 p 2 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

The machine tool industry's basic mission is to increase the output of machines with programmed control and metal processing equipment. The Charentsavanskiy Machine Tool Production Association's development and series production of complete electric drives with high moment motors are reviewed. B.G.

N85-19213# Joint Publications Research Service, Arlington, Va.
DEAN OF KIEV STATE UNIVERSITY ON IMPACT OF ROBOTS c37
I. I. Lyashko *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 6-11 Transl. into ENGLISH from Pod Znamenem Leninizma (Kiev), no. 16, Aug. 1984 p 67-69 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

In the modern sense of the word, robots are a prospective means of complete automation and of solving pressing national economic and social problems, including the problem of manpower resources and improving working conditions. The role of robotics is discussed in its relationship to electronic components, manufacturing, productivity, and social impact. B.G.

N85-19214# Joint Publications Research Service, Arlington, Va.
PRODUCTION TURRET LATHE RETROFITTED WITH ROBOT c37
V. A. Petrov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 17-21 Transl. into ENGLISH from Stroit. Dor. Mashiny (Moscow), no. 7, Jul. 1984 p 7-9 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

The robot engineering complex (REC) includes a modernized turret lathe, a RF-201M robot, a blank storage unit, a stripper, mandrel, and other auxiliary devices. Equipment specifications and work functions are described. B.G.

N85-19215# Joint Publications Research Service, Arlington, Va.
SPECIFICATIONS, APPLICATIONS OF GANTRY ROBOTS VIEWED c37
V. I. Tsarenko, V. A. Popov, V. P. Sobolev, and P. I. OVchimnikov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 22-30 Transl. into ENGLISH from Mekhan. (Moscow), no. 7, Jul. 1984 p 4-6 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

The ENIMS (Experimental Scientific Research Institute of Metal Cutting Machine Tools) developed a series of industrial robots (PR) of the gantry type with a load capacity of 160 Kg of unit design for use with a broad product list (up to 88 models) of modern metal cutting machine tools with horizontal or vertical disposition of spindles, as well as, machine tools with a horizontal table. The basic specifications of the robot are presented and schematics of the device are described. B.G.

N85-19216# Joint Publications Research Service, Arlington, Va.
ROBOTIZED BLANKS LOADER FOR NEW FORGE PRESS c37
In its USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 31 Transl. into ENGLISH from Leningr. Pravda (Leningrad), 21 Sep. 1984 p 1 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

Many industrial sectors need large size forgings from castings weighing more than 200 tons. A 6000 ton press, manipulator robot, forging crane, thermal furnaces and other equipment were designed

to operate in an automatic coordinate mode dictated by a computer. The devices make possible the use of whole large size intermediate products with uniform quality of metal, instead of welded ones that are labor-intensive in manufacturing. B.G.

N85-19217# Joint Publications Research Service, Arlington, Va.
FLEXIBLE APPLICATIONS ROBOT USED IN MOSCOW TRAINING COURSE **c37**
L. Selyunina *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 32-33 Transl. into ENGLISH from Sots. Ind. (Moscow), 1 Sep. 1984 p 3 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

Training programs for robotics students are described with emphasis on practical experience. B.G.

N85-19218# Joint Publications Research Service, Arlington, Va.
CONTROL SYSTEM OF COMPLEX CNC MACHINING CELL **c61**
T. M. Yavid *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 34-39 Transl. into ENGLISH from Mekhan. i Avtomatiz. Proizv. (Moscow), no. 6, Jun. 1984 p 27-29 (For primary document see N85-19211 10-37)
Avail: NTIS HC A04

The ASK-20 cell consists of a group of machine tools, a machining center with accumulators, a conveyor system, an automated storage unit with stock-piling machine, worker positions for loading (unloading) parts, an accessory assembly department, a tool preparation department, and a control system. The system's flexibility makes it possible to reduce the labor-intensiveness. B.G.

N85-19219# Joint Publications Research Service, Arlington, Va.
PRODUCTIVITY GAINS THROUGH CAD OF CNC PROGRAMS **c61**
V. A. Bakhvalov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 40-46 Transl. into ENGLISH from Mekhan. i Avtomatiz. Proizv. (Moscow), no. 5, May 1984 p 10-12 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

For small series and series type production facilities, the main means of automation is the use of numerically controlled (NC) machine tools. The advantages are listed along with the disadvantages. The computer aided design of control programs (CAD-CP) is used to reduce the labor intensiveness and to increase the quality of preparing control programs for NC machine tools. B.G.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-19220 British Broadcasting Corp., London (England). Engineering Div.
TELEVISION ANIMATION STORE: RECORDING PICTURES ON A PARALLEL TRANSFER MAGNETIC DISC
A. J. Durey Dec. 1984 19 p refs
(BBC-RD-1984/17) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

The recording and replaying of digital video signals using a computer-type magnetic disc-drive as part of an electronic rostrum camera animation system is described. The system was developed to enable picture sequences to be generated directly as television signals, instead of using cine film. The characteristics of the disc-drive are described together with data processing, error protection and signal synchronization systems, which enable digital television YUV component signals, sampled at 12 MHz, 4 MHz and 4 MHz respectively, to be recorded and replayed in real time. M.G.

N85-19221*# Wisconsin Univ., Madison. Dept. of Meteorology.
RESOLUTION ENHANCEMENT OF MULTICHANNEL MICROWAVE IMAGERY FROM THE NIMBUS-7 SMMR FOR MARITIME RAINFALL ANALYSIS
William S. Olson, Chia-Lung Yeh, James A. Weinman, and Roland T. Chin [1985] 29 p refs
(Grant NAGw-380)
(NASA-CR-174367; NAS 1.26:174367) Avail: NTIS HC A03/MF A01 CSCL 20N

A restoration of the 37, 21, 18, 10.7, and 6.6 GHz satellite imagery from the scanning multichannel microwave radiometer (SMMR) aboard Nimbus-7 to 22.2 km resolution is attempted using a deconvolution method based upon nonlinear programming. The images are deconvolved with and without the aid of prescribed constraints, which force the processed image to abide by partial a priori knowledge of the high-resolution result. The restored microwave imagery may be utilized to examined the distribution of precipitating liquid water in marine rain systems. Author

N85-19222*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BROAD-BAND UHF DIPOLE ARRAY
M. C. Bailey Feb. 1985 47 p refs
(NASA-TM-86373; NAS 1.15:86373) Avail: NTIS HC A03/MF A01 CSCL 20N

A 6X6 array of fan-dipoles was designed to operate in the 510 to 660 MHz frequency range for aircraft flight test and evaluation of a UHF radiometer system. A broad-band dipole design operating near the first resonance is detailed. Measured VSWR and radiation patterns for the dipole array demonstrate achievable bandwidths in the 35 percent to 40 percent range. Author

N85-19223# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SURVEY OF VLF-OMEGA TRANSMISSIONS RECEIVED DURING SUMMER AT ANTARCTIC PENINSULA
P. Kaufmann, L. Rizzo Piazza, and N. M. Paes Leme Jan. 1985 17 p refs Presented at SCAR Workshop, Bremerhaven, West Germany, Sep. 1984 Submitted for publication
(INPE-3399-PRE/666) Avail: NTIS HC A02/MF A01

Preliminary results are presented for nearly one month of measurements of all existing VLF-OMEGA transmissions performed by tracking stations controlled by atomic frequency standards, operated at Brazilian Antarctic station, Ferraz, in February 1984. For comparison purposes, simultaneous measurements were taken at Itapetinga Radio Observatory, near Sao Paulo by a single tracking station. Basic propagation characteristics in phase, signal strength and nighttime modal interference were established for all transmissions, for at least three days each. A more detailed survey was performed on OMEGA-Argentina transmission, which was tracked for the whole period. These transmissions displayed systematic nighttime mode conversion effects, with a characteristic sudden phase delay peak at sunrise. The mean diurnal phase variation of OMEGA-Argentina transmissions, received at Ferraz, display diurnal phase variations much larger than expected at 13.6 kHz, and much smaller at 10.2 kHz. Author

N85-19224*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, Oct. - Dec. 1984
E. C. Posner, ed. 15 Feb. 1985 282 p refs
(NASA-CR-174366; JPL-TDA-PR-42-80; NAS 1.26:174366) Avail: NTIS HC A13/MF A01 CSCL 17B

Reports on developments in space communications, radio navigation, radio science, and ground-based radio astronomy are presented. Activities of the Deep Space Network (DSN) are reported in the areas of planning, supporting research and technology, implementation and operations. The application of radio interferometry at microwave frequencies for geodynamic measurements is also discussed. For individual titles, see N85-19225 through N85-19248.

N85-19225*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ARCSECOND POSITIONS FOR MILLIARCSECOND VLBI NUCLEI OF EXTRAGALACTIC RADIO SOURCES. PART 3: 74 SOURCES c93
D. D. Morabito, R. A. Preston, R. P. Linfield, M. A. Slade, A. E. Wehrle (California Univ., Los Angeles), J. Faulkner (Univ. of Southern California), and D. L. Jauncey (CSIRO) *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 1-7 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 03B

VLBI measurements at 2290 MHz and 8420 MHz on baselines of 10,000 km between Deep Space Network stations have been used to determine the positions of the milliarcsecond nuclei in 74 extragalactic radio sources. Estimated accuracies range from 0.1 sec. to 4, 3 sec. in both right ascension and declination with typical accuracies of approx. 0.3 sec. The observed sources are part of an all-sky VLBI catalog of milliarcsecond radio sources. Arcsecond positions have now been determined for 819 sources. These positions are presently being used to identify optical counterparts in the Southern Hemisphere. Author

N85-19226*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MICROWAVE SURFACE RESISTIVITY OF SEVERAL MATERIALS AT AMBIENT TEMPERATURE
H. F. Reilly, J. J. Bautista, and D. A. Bathker *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 8-11 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20N

Microwave surface resistivity of a number of metal and other sample materials was measured at X-band, approximately 8400 MHz. The method of measurement uses a TE sub 011 mode circular waveguide cavity resonator wherein the sample is used as one end of the cavity. This method has been used previously in JPL work with good results. Microwave reflection loss and noise arising from the dissipative loss are given, for materials having negligible transmission leakage. Author

N85-19227*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECTS OF MODE IMPURITY OF Ka-BAND SYSTEM PERFORMANCE c33
D. J. Hoppe, W. A. Imbriale, and A. M. Bhanji *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 12-23 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 09A

Problems associated with spurious mode generation in the proposed Ka-Band gyroklystron transmitter tube, overmoded transmission line, and feed are discussed. A brief description of the overall problem is presented. The theory used to evaluate feed and antenna performance when spurious modes are present is given. Results for feed patterns and overall antenna patterns for various levels and types of spurious modes are presented. Worst case antenna efficiency is calculated as a function of spurious mode level. Conclusions are drawn regarding the results of this study and their application to specifications on the transmitter tube and transmission line system. Author

N85-19228*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DETECTION AND SYMBOL SYNCHRONIZATION FOR MULTIPLE-BIT PER PHOTON OPTICAL COMMUNICATIONS
W. K. Marshall *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 24-30 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 17B

Methods of detection and synchronization in a highly efficient direct detection optical communication system are reported. Results of measurements on this moderate-rate demonstration system capable of transmitting 2.5 bits/detected photon in low-background situations indicate that symbol slot synchronization is not a problem, and that a simple symbol detection scheme is adequate for this situation. This system is a candidate for interplanetary optical communications. Author

N85-19229*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGHLY EFFICIENT Nd:YAG LASERS FOR FREE-SPACE OPTICAL COMMUNICATIONS c36
D. L. Sipes, Jr. *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 31-39 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20E

A highly efficient Nd:YAG laser end-pumped by semiconductor lasers as a possible free-space optical communications source is discussed. Because this concept affords high pumping densities, a long absorption length, and excellent mode-matching characteristics, it is estimated that electrical-to-optical efficiencies greater than 5% could be achieved. Several engineering aspects such as resonator size and configuration, pump collecting optics, and thermal effects are also discussed. Finally, possible methods for combining laser-diode pumps to achieve higher output powers are illustrated. E.A.K.

N85-19230*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONDENSED ANTENNA STRUCTURAL MODELS FOR DYNAMICS ANALYSIS
R. Levy *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 40-61 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20N

Condensed degree-of-freedom models are compared with large degree-of-freedom finite-element models of a representative antenna-tipping and alidade structure, for both locked and free-rotor configurations. It is shown that: (1) the effective-mass models accurately reproduce the lower-mode natural frequencies of the finite element model; (2) frequency responses for the two types of models are in agreement up to at least 16 rad/s for specific points; and (3) transient responses computed for the same points are in good agreement. It is concluded that the effective-mass model, which best represents the five lower modes of the finite-element model, is a sufficient representation of the structure for future incorporation with a total servo control structure dynamic simulation. E.A.K.

N85-19231*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTERPOLATION METHODS FOR GTD ANALYSIS OF SHAPED REFLECTORS
V. Galindo-Israel, W. A. Imbriale, Y. Rahmat-Samii, and T. Veruttipong *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 62-67 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20N

The finding of smooth analytic representations for antenna reflector surfaces which are prescribed only by discretized data obtained by various synthesis methods is examined. Frequently the data are distributed in a nonuniform grid and contain noise. The smoothness required is to C sub 1 for physical optics diffraction analysis and to C sub 2 for geometrical theory of diffraction (GTD) analysis. The GTD analysis approach requires a surface description which returns data very rapidly. Two methods of interpolation, the global and the local methods, are discussed. They each have advantages and disadvantages; characteristics are discussed and examples are presented. E.A.K.

N85-19232*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DESIGN PROCEDURE FOR THE NEW 70-METER ANTENNA SUBREFLECTOR POSITIONER
R. D. Hughes *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 68-82 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20N

Design procedures are developed for determining Cassegrain

type antenna subreflector positioner strength and displacements under wind and gravity loading conditions. The procedures are applied to the JPL 70-m antenna subreflector design, and the resulting design details are presented. The generalized analysis can be adapted to other antenna and subreflector-positioners. It is shown that the new design meets the strength and displacements criteria under worst case loading. E.A.K.

N85-19233*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUBREFLECTOR FOCUSING TECHNIQUES APPLIED TO NEW DSS-15 AND DSS-45 34-METER ANTENNAS
R. D. Hughes and M. S. Katow *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 83-90 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20N

An improved technique to determine the subreflector translations required to properly focus a Cassegrainian antenna, under gravity loading, at a full range of elevation angles, is presented. This technique is applied to the 34-m antenna configuration installed at stations DSS-15 (Goldstone, California) and DSS-45 (Australia). The subreflector lateral and axial translations, to be stored into the antenna-control systems, are computed and tabulated. The relationships that govern the main parameters are also presented for future subreflector focusing analysis under wind and thermal loadings. E.A.K.

N85-19234*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REED-SOLOMON CODE SYNCHRONIZATION REVISITED
L. J. Deutsch *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 91-96 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 17B

A concatenated coding consisting of an inner (7, 1/2) convolutional code and an outer (255, 223) Reed-Solomon code was recommended by the Consultative Committee for Space Data Systems for cross-supported space missions. The Reed-Solomon code that was chosen makes use of the Berlekamp encoding algorithm. Some peculiarities of this code that could give rise to synchronization problems are examined. Suggestions are given to alleviate these problems. Author

N85-19235*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FURTHER RESULTS ON RATE 1/N CONVOLUTIONAL CODE CONSTRUCTIONS WITH MINIMUM REQUIRED SNR CRITERION
P. J. Lee *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 97-102 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 17B

New good (K, 1/N) convolutional codes for 8 < or = to K < or = to 13 and 2 < or = to N < or = to 8 were found and tabulated which require minimum signal-to-noise ratio (SNR) for given desired bit error rates (BER) with Viterbi decoding. The transfer function bound was used for the BER evaluations. These low-rate codes are expected to have a number of applications, especially for systems having large bandwidth-bit time products such as deep space and spread spectrum communication systems. R.S.F.

N85-19236*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONCEPTS AND TOOLS FOR THE SOFTWARE LIFE CYCLE **c61**
R. C. Tausworthe *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 103-120 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 09B

The tools, techniques, and aids needed to engineer, manage, and administer a large software-intensive task are themselves parts of a large softwaare base, and are incurred only at great expense. The needs of the software life cycle in terms of such supporting tools and methodologies are highlighted. The concept of a distributed network for engineering, management, and administrative functions is outlined, and the key characteristics of localized subnets in high-communications-traffic areas of software activity are discussed. A formal, deliberate, structured, systems-engineering approach for the construction of a uniform, coordinated tool set is proposed as a means to reduce development and maintenance costs, foster adaptability, enhance reliability, and promote standardization. Author

N85-19237*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANTENNA AXIS DRIVE TORQUES FOR THE 70-METER ANTENNA **c37**
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 121-126 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

Antenna axis speeds versus wind speeds are given in terms of dish size, hydraulic motor size, and the number of servo valves. An increase in the dish diameter of antenna is usually accompanied by increases in the axis torques required to drive the antenna against wind. The proposed increase in the diameters of the 64-m antenna dishes to 70 m (plus a noise shield) does require increased axis torques. The increased dish diameter causes the maximum azimuth and elevation torques to increase 48% and 43% respectively. R.S.F.

N85-19238*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN EVALUATION OF THE 64-METER ANTENNA RADIAL BEARING FOR USE ON THE 70-METER ANTENNA **c37**
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 127-141 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

The derivation of the proper truck preload is discussed and is shown to be dependent upon the azimuth drive preload direction, the wind direction and magnitude, and the out of roundness of the track. The resulting wheel and track contact stresses were evaluated and found to be satisfactory for either the 64-m or 70-m antenna. The wheel bearing loads were found to be quite satisfactory for the larger 70-m antenna. Methods for evaluating the effects of track out of roundness and for aligning the wheel and truck assemblies are presented. It is believed that these methods are practical and that the increased loadings on the parts should not affect the expected long life of the azimuth bearing. R.S.F.

N85-19239*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELEVATION BEARING MAXIMUM LOAD, 70-METER ANTENNA **c37**
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 142-145 ref (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

One of the preliminary frequency analyses of the 64-m antenna disclosed that considerable flexibility was attributable to the structure adjacent to the elevation bearings. In order to reduce this compliance, this adjacent structure and the bearings were made substantially larger. The result is that the stresses in these parts are small when used with the 64-m reflector and should remain sufficiently small when used with the larger 70-m reflector, which has an extended one-meter noise shield at its outer edge. The loads on the elevation bearings of the larger 70-m reflector are documented and these loads are compared to the corresponding ones of the 64-m antenna. R.S.F.

N85-19240*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CHARACTERISTICS OF THE ELEVATION DRIVE SUSPENSION

OF THE 64-METER ANTENNAS c37
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 146-175 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

The elevation axis drive unit of the DSN 64-m antennas is arranged so that its output pinion can self-align to the bull gear. The design is described and conflicting desiderata are discussed. Static stability criterion for the elevation drive, derivation of strut stiffness ratios, and an outline for removing, installing, and adjusting the vertical struts are included. B.G.

N85-19241*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HYDROSTATIC BEARING PAD MAXIMUM LOAD AND OVERTURNING CONDITIONS FOR THE 70-METER ANTENNA c37
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 176-179 ref (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

The reflector diameters of the 64-m antennas were increased to 70-m. In order to evaluate the minimum film thickness of the hydrostatic bearing which supports the antenna weight, it is first necessary to have a good estimation of the maximum operational load on the most heavily loaded bearing pad. The maximum hydrostatic bearing load is shown to be sufficiently small and the ratios of stabilizing to over turning moments are ample. B.G.

N85-19242*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE OF THE DSA'S SUBCARRIER DEMODULATION DIGITAL LOOP
M. K. Simon and A. Mileant *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 180-194 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20N

The subcarrier demodulation digital loop is part of the baseband assembly. The subcarrier demodulator is a fourth-order Costas-type loop corresponding to a type 2 analog loop in terms of steady state response. The expected value and the variance of the error signal are determined as functions of the input SNR. A Nyquist sampling rate of the input signal is assumed. From the integro-difference equations a mixed s/z domain block diagram is obtained. From the loop's transfer function a set of gains for the loop filter is obtained. Also, a set of state equations is presented for future reference. Finally, the noise-equivalent bandwidths are calculated for normalized computation times of 0, 0.25 and 0.5. The subcarrier demodulator analyzed tracks a parabolic phase input with finite steady state error. Since at each update instant the loop gains are adjusted to compensate for the variations in SNR of the input signal, the noise-equivalent bandwidth is maintained constant.
Author

N85-19243*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VENUS BALLOON PROJECT c91
R. A. Preston, J. H. Wilcher, and C. T. Stelzried *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 195-201 (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 03B

During the Soviet Vega Mission to Venus and Comet Halley, two instrumented balloons will be placed into the Venusian atmosphere in June 1985. These Soviet/French balloons will be used to study the structure and dynamics of the Venusian atmosphere by means of in situ measurements and earth-based VLBI determination of balloon position and velocity. The DSN 64-meter subnet will be part of an international network of antennas organized by the French to support this mission. The DSN is installing new L-band receiving systems for this task. All scientific data from the balloons will be analyzed by a joint Soviet/French/U.S. science team. Author

N85-19244*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN 34-METER ANTENNA OPTICS ANALYSIS FOR WIDEBAND SETI INVESTIGATIONS
S. D. Slobin *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 202-219 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20N

A DSN 34-meter symmetric Cassegrain antenna configuration is examined for wideband use over the frequency range of 1 to 10 GHz, rather than only at the narrow-band operational design frequencies of 2.295 GHz (S-band) and 8.448 GHz (X-band). Aperture efficiency and surface efficiency are calculated as the components determining the gain of the antenna. Noise temperature contributions arise from the ground, atmosphere, and quadripod scattering. These components are calculated as a function of frequency elevation angle to determine a G/T (gain/system noise temperature) figure-of-merit for a nominal 34-meter antenna configuration. A computational method was developed which will enable design of a multi-horn antenna feed system to optimally cover the 1 to 10 GHz frequency range. Author

N85-19245*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HISTORICAL COST CURVES FOR HYDROGEN MASERS AND CESIUM BEAM FREQUENCY AND TIMING STANDARDS c36
D. S. Remer and R. C. Moore *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 220-228 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20E

Historical cost curves were developed for hydrogen masers and cesium beam standards used for frequency and timing calibration in the Deep Space Network. These curves may be used to calculate the cost of future hydrogen masers or cesium beam standards in either future or current dollars. The cesium beam standards are decreasing in cost by about 2.3% per year since 1966, and hydrogen masers are decreasing by about 0.8% per year since 1978 relative to the National Aeronautics and Space Administration inflation index. R.J.F.

N85-19246*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ACCURACY OF RADIO INTERFEROMETRIC MEASUREMENTS OF EARTH ROTATION c46
T. M. Eubanks, J. A. Steppe, and M. A. Spieth *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 229-235 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 08E

The accuracy of very long base interferometry earth rotation (UT1) measurements is examined by intercomparing TEMPO and POLARIS data for 1982 and the first half of 1983. None of these data are simultaneous, and so a proper intercomparison requires accounting for the scatter introduced by the rapid, unpredictable, UT1 variations driven by exchanges of angular momentum with the atmosphere. A statistical model of these variations, based on meteorological estimates of the Atmospheric Angular Momentum is derived, and the optimal linear (Kalman) smoother for this model is constructed. The scatter between smoothed and independent raw data is consistent with the residual formal errors, which do not depend upon the actual scatter of the UT1 data. This represents the first time that an accurate prediction of the scatter between UT1 data sets were possible. R.J.F.

N85-19247*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CODES WITH PARITY CONDITIONS ON SUBSETS OF COORDINATES c64
E. C. Posner and Z. Reichstein *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 236-247 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 12A

Binary codes with the constraint that the codes restricted to certain subsets of columns must be contained in particular codes

of the shorter lengths are considered. In particular, codes of even length 2k, and of minimum distance approximately greater than d, where in the code obtained by restricting to the first k positions has even weight and at the same time the code obtained by restricting to the last k positions also has even weight are considered. If k = 2n, n odd, and d = 2n, it is proved that the code has at most 8n - 4 codewords, and 8n - 4 is attainable for n = 3. This permits a file-transfer protocol control function assignment for personal computers to be chosen for 20 control functions using essentially just pairs of upper-case alphabetic ASCII characters where the Hamming distance between the binary forms of every two different control functions is at least six. R.J.F.

N85-19248*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

UTILIZATION OF MOBILE VLBI FOR GEODETIC MEASUREMENTS c43

J. M. Davidson and D. W. Trask *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 248-266 refs (For primary document see N85-19224 10-32)

Avail: NTIS HC A13/MF A01 CSCL 08E

Three mobile very long base interferometry (VLBI) systems were fabricated for the NASA Crustal Dynamics Project. These systems include the 9-meter-diameter MV-3 telescope. Since 1980, mobile systems operated in conjunction with several fixed base stations in the western United States as part of a geodetic survey program to determine relative motions and regional strain fields near the tectonic plate boundaries in California and Alaska. A description is given of the three mobile systems and the environment in which they must function. The inherent accuracy of mobile VLBI measurements is assessed, based on a consideration of major sources of error. Some recent results are presented which serve to illustrate various aspects of the error model and are of geodetic interest as they span the broad region surrounding the surface trace of the San Andreas Fault. These results indicate that baseline measurements utilizing the current mobile VLBI systems attained an accuracy of 2 cm or better in the horizontal plane. It is likely that crustal motions will be detected within the next few years, provided they are presently occurring at the geological rates. R.J.F.

N85-19249# Naval Research Lab., Washington, D. C.

THE AMBIGUITY FUNCTION OF RANDOM BINARY-PHASE-CODED WAVEFORMS

C. Lin 4 Dec. 1984 13 p

(AD-A148906; NRL-8856) Avail: NTIS HC A02/MF A01 CSCL 09/3

The cross-correlation technique for signal detection and parameter estimation is widely used in communication and radar systems. For popular binary waveforms, the properties of their ambiguity functions have been studied for years. However, the results are generally restricted to specific codes which are either deterministic or pseudorandom. From the uncooperative reception viewpoint, without a priori knowledge of the emitted signal in many cases, the cross-correlating signals may be considered truly random. The report investigates the ambiguity function of truly random binary-phase-coded waveforms as an approximation to those waveforms commonly employed in binary-phase-coded waveforms as an approximation to those waveforms commonly employed in binary-modulated pseudorandom systems/encoded radar systems. Here, in a statistical sense, the ambiguity function of a truly random binary-phase-coded waveform is analytically derived in which the normally used deterministic cross-correlation process is replaced by its ensemble average. Various Doppler responses are presented and discussed. The results are compared with those obtained by transmitting an aperiodic maximum-length pseudorandom sequence. It is shown that the ambiguity function of the latter case is closely represented by the ensemble-average response of the truly random binary signal of equal length. With the transmitted signal unknown to a cross-correlator, the characteristics of the ambiguity function derived here provides predictive characteristics useful for practical cross-correlator system design. GRA

N85-19250# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision.

MULTI TARGET TRACKING BY DYNAMIC SCENE ANALYSIS

T. Kronhamn Aug. 1984 8 p

(Contract N00014-77-C-0532)

(AD-A148922; LIDS-P-1397) Avail: NTIS HC A02/MF A01 CSCL 17/9

An analysis is made per scan of the received returns based on their geometric interrelations only. From this, a large scale view of the tracking and the data received can be taken. Ultimately the ability of the human observer in identifying target formations, specific ECM patterns etc. would be desirable. However, a first step is taken with the objective to make feasible the initiation and tracking of large groups of targets. The analysis algorithm developed has the unique feature of defining a hierarchy of groups. This is the key feature both for its use in identification as well as in the initiation and tracking processes as described below. The method sets no limit on formation size and the track initiation phase is handled with the same ease as tracking as demonstrated in the example. The method is believed to be a good basis for multitarget tracking even in a more realistic radar environment and with other kinds of target behavior. The paper presented a radar scene analysis algorithm. It was shown to easily cope with track initiation of a large formation of aircrafts, a problem giving previous methods big problems. The method is believed to be a general multitarget tracking tool but further work must be done to include a more realistic radar environment and other kinds of target behavior. GRA

N85-19251# Massachusetts Inst. of Tech., Cambridge. Lab. of Electronics.

AN OBJECT-ORIENTED SIGNAL PROCESSING ENVIRONMENT: THE KNOWLEDGE-BASED SIGNAL PROCESSING PACKAGE

W. P. Dove, C. Myers, and E. E. Milios Oct. 1984 75 p

(Contract N00014-81-K-0742)

(AD-A148963; TR-502) Avail: NTIS HC A04/MF A01 CSCL 17/2

A LISP-based signal processing package for integrated numeric and symbolic manipulation of discrete-time signals is described. The package is based on the concept of signal abstraction in which a signal is defined by its non-zero domain and by a method for computing its samples. Most common signal processing operations are defined in the package and the package provides simple methods for the definition of new operators. The package provides facilities for the manipulation of infinite duration signals and periodic signals, for the efficient computation of signals over intervals, and for the catching of signal values. The package is currently being expanded to provide for manipulation of continuous-time signals and symbolic signal transformations, such as the Fourier transform, to form the basis of knowledge-based signal processing systems. GRA

N85-19252# Department of the Air Force, Washington, D.C.

BISTATIC COHERENT RADAR RECEIVING SYSTEM Patent Application

L. C. Yamano, inventor (to Air Force) Filed 31 Oct. 1984 30 p

(AD-D011447; US-Patent-Appl-SN-666841) Avail: NTIS HC A03/MF A01 CSCL 17/9

A coherent-on-receive MTI radar receiver system for use with cooperative or non-cooperative radar transmitters of either the coherent or noncoherent, simple magnatron type and scanning antennas is discussed. The receiver includes coherent digital signal processing with provision for normalizing or compensating phase variations in the transmitter carrier pulses. Author (GRA)

N85-19253# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

PROCEEDINGS OF THE 17TH SYMPOSIUM ON ELECTROMAGNETIC WINDOWS, PART 1 Final Report, 9 May 1984 - 8 May 1985

J. N. Harris and G. H. Adams 1984 26 p Proc. held in Atlanta, 25-27 Jul. 1984

(Contract DAAG29-84-M-0346)

(AD-A149185; ARO-21807.1-MS-CF-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 17/9

Thirty papers covering the areas of radome electrical design and analysis, test and evaluation of radome materials, radome materials, and rain erosion were presented at the Seventeenth Electromagnetic Window Symposium held at the Georgia Institute of Technology, July 25 to 27, 1984. The history of these symposia and the organization of the current symposium is described. Appendices are given listing papers presented and personnel attending. GRA

N85-19254# Naval Research Lab., Washington, D. C.
AN HF COMMUNICATIONS FREQUENCY-MANAGEMENT PROCEDURE FOR FORECASTING THE FREQUENCY OF OPTIMUM TRANSMISSION
M. Daehler 31 Dec. 1984 26 p
(AD-A149191; NRL-MR-5505) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report describes a procedure for forecasting the Frequency of Optimum Transmission (FOT) on a high-frequency communications path when the Maximum Observable Frequency (MOF) on another path and an historical record of the correlations of MOFs measured on the two paths are known. The procedure, known as Updating uses MOF values measured by an oblique-incidence sounder on one path to adjust the MOF forecast by the MINIMUF model for a second path. The model is Updated by using one of its input parameters, the solar 10.7 cm flux, as an adjustable parameter to make the predicted MOF equal the measured MOF on the sounded path. The measurement of the correlation coefficient connecting MOFs measured on a pair of sounded paths is discussed. After forecasting MOF, statistical methods are used to determine the FOT, which may be defined as the highest frequency not exceeded by the MOF ninety percent of the time. Data from the 1980 Solid Shield series of ionospheric measurements are used in examples of correlation coefficient measurements, Updated forecasts, and FOT determinations. GRA

N85-19255# Naval Research Lab., Washington, D. C.
MTI SYSTEM SIMULATION AND CLUTTER OUTPUT STATISTICS Interim Report
J. K. Hsiao 31 Dec. 1984 14 p
(AD-A149193; NRL-8858) Avail: NTIS HC A02/MF A01 CSCL 17/9

A radar return from a patch of clutter usually consists of a large number of echoes from individual scatterers. Each of these scatterers moves randomly and introduces a randomly distributed Doppler spectrum. Therefore, to simulate the performance of a MTI (Moving Target Indicator) system, we must sum a large number of randomly distributed samples from each radar pulse return. The computer-time required in this case is very lengthy, and therefore it is not feasible for us to use this approach in a large-scale simulation. In this report we use a simplified clutter return model for MTI simulation. We show how this model produces the same correlation function and spectral density function as the ones measured from an actual radar return. We then use this simulation program to compute the statistical distribution of the improvement factor of a MTI system with binomial weights. GRA

N85-19256# CyberCom Corp., Arlington, Va.
UHF RADIOWAVE PROPAGATION THROUGH FORESTS Annual Technical Report, Apr. 1983 - Apr. 1984
R. H. Lang, A. Schneider, F. J. Altman, and K. Truong Fort Monmouth, N.J. Army Communications-Electronics Command May 1984 248 p
(Contract DAAK80-81-C-0136; DA Proj. 1L1-61102-AH-48)
(AD-A149518; CTR-108-06; CECOM-81-0136-6) Avail: NTIS HC A11/MF A01 CSCL 20/14

A model for Ultrahigh Frequency radiowave propagation through a forest of tree trunks, branches, and leaves which had been first described in a previous report has been extended. Forest characterization includes the dielectric properties of green wood and leaves, tree trunk diameter distributions, branch orientation, and canopy structure. Plots of the effective dyadic susceptibility and specific attenuation for homogeneous and non-homogeneous forests of tree trunks are presented. The theory of the anisotropic forest slab model is extended to include the forest floor and multiply-reflected space and lateral waves. Basic transmission losses versus frequency for various radiolink geometries are plotted, as are the responses to five-nanosecond pulses at 600 MHz. Incoherent multiple scattering in a two-dimensional forest of tree trunks, small or large with respect to the wavelength, is studied. Plots are shown for single-tree scatter patterns, albedos, and total cross-sections versus frequency, as well as normalized coherent and incoherent scattering intensities versus distance, and normalized frequency- and space-correlation functions.
Author (GRA)

N85-19257# Stanford Univ., Calif. Space Telecommunications and Radioscience Lab.
PROPAGATION OF ELECTROMAGNETIC FIELDS ALONG THE SEA/SEA-BED INTERFACE Final Technical Report, 15 Aug. 1979 - 15 Apr. 1983
A. S. Inan Feb. 1984 64 p
(Contract N00014-79-C-0848)
(AD-A149523; E721-2) Avail: NTIS HC A04/MF A01 CSCL 17/2

The propagation of electromagnetic fields along the sea/sea-bed interface is considered for frequencies in the ULF/ELF range (frequencies less than 3 kHz) and for three different sources (a vertical magnetic dipole, a horizontal electric dipole, and an infinite cable, all located on the interface). The interface is assumed to be a plane boundary separating the two semi-infinite conducting media representing the sea and the material comprising the sea bed; this assumption enables use to be made of field expressions derived previously for harmonically-varying current sources located at a plane boundary. The field components are calculated numerically and compared with those that would be produced under the same conditions in sea water of infinite extent. It is found that: (1) the fields can propagate no longer distances along the sea floor because of the lower sea-bed conductivities, and (2) new field components are produced as a result of the presence of the sea/sea-bed interface. Some of these new components are larger at longer distances than the other field components; they are also more sensitive to the conductivity of the sea bed at low frequencies. GRA

N85-19258# Naval Postgraduate School, Monterey, Calif.
HF BROADBAND WHIP ANTENNA EVALUATION Final Report, 1 Jul. - 1 Oct. 1984
R. W. Adler and H. B. Shaw, III Oct. 1984 20 p
(AD-A149527; NPS62-84-064) Avail: NTIS HC A02/MF A01 CSCL 09/5

Present Navy shipboard antenna couplers used with whip antennas will not suffice for future frequency agile transmitting systems. A new broadband whip antenna which operates without a coupler should be evaluated for potential application in a frequency hopping mode. VSWR for various mounting configurations and gain relative to a 35 foot whip were measured in this initial portion of the evaluation. VSWR was typically less than 2:1 and relative gain averaged -19 dB with respect to a standard Navy 35 foot whip. Author (GRA)

N85-19259*# Dynamics Research Corp., Wilmington, Mass.
APPLICATION OF THE HARDMAN METHODOLOGY TO THE SINGLE CHANNEL GROUND-AIRBORNE RADIO SYSTEM (SINCGARS) Final Report, Nov. 1982 - Jan. 1984
J. Balcom, J. Park, L. Toomer, and T. Feng Dec. 1984 308 p
(Contract NAS7-100; DA Proj. 2Q2-63743-A-792)
(NASA-CR-175486; NAS 1.26:175486; AD-A149532; ARI-RN-84-139) Avail: NTIS HC A14/MF A01 CSCL 17B

The HARDMAN methodology is designed to assess the human resource requirements early in the weapon system acquisition process. In this case, the methodology was applied to the family of radios known as SINCGARS (Single Channel Ground-Airborne Radio System). At the time of the study, SINCGARS was approaching the Full-Scale Development phase, with

2 contractors in competition. Their proposed systems were compared with a composite baseline comparison (reference) system. The systems' manpower, personnel and training requirements were compared. Based on RAM data, the contractors' MPT figures showed a significant reduction from the figures derived for the baseline comparison system. Differences between the two contractors were relatively small. Impact and some tradeoff analyses were hindered by data access problems. Tactical radios, manpower and personnel requirements analysis, impact and tradeoff analysis, human resource sensitivity, training requirements analysis, human resources in LCSMM, and logistics analyses are discussed. GRA

N85-19260# Spire Corp., Bedford, Mass.
LITHOGRAPHY RADIATION EFFECTS STUDY Final Technical Report, Nov. 1980 - Nov. 1983
B. W. Murray Nov. 1984 97 p
(Contract F19628-80-C-0196)
(AD-A149552; RADC-TR-84-233) Avail: NTIS HC A05/MF A01 CSCL 14/5

An experimental X-ray lithography facility for irradiating thin films of a photoresist next to a gold mask is described. The X-ray irradiance and PMMA irradiation times are estimated for several target elements with characteristic X-ray lines in the 1-3 keV energy range. A gold mask (6800 A thick) deposited with films of carbon 100, 220, 520 and 710 A thick were placed next to films of PBS resist and irradiated with X-rays from Al, Ag, and Ti targets bombarded by 10 keV electrons. The exposed PBS was etched for a fixed time interval, and the thickness of the etched resist next to the varying film thickness of carbon was measured by optical ellipsometry. The plot of etched PBS thickness vs. carbon film thickness gave a measure of the depth of penetration of X-ray photoelectrons from the gold mask into the resist and a possible method of measuring dose-depth profiles at material interfaces at soft X-ray energies. A realistic, calculational model that includes source bremsstrahlung predicts fairly well experimental dose profile for the Au/C mask. GRA

N85-19261# Department of the Air Force, Washington, D.C.
LOW VOLTAGE TWO WIRE TO FOUR WIRE TELEPHONE CIRCUIT CONVERTER APPARATUS Patent Application
D. Pacini, inventor (to Air Force) Filed 8 Mar. 1983 14 p
(AD-D011449; US-Patent-Appl-SN-473384) Avail: NTIS HC A02/MF A01 CSCL 17/2

This abstract describes a low voltage two wire to four wire telephone circuit converter apparatus utilizing a series pair of amplifiers to provide a transmit data out signal that is referenced to analog ground. A pair of amplifiers is in parallel to receive data in single which is referenced to analog ground and apply it to the telephone unit. A signal adapter converts the telephone ring signal to a constant level for transmission over a digital channel in a fiber optic link. GRA

N85-19262# Department of the Army, Washington, D. C.
SURVIVABLE LOCAL AREA NETWORK Patent Application
J. L. Katz, inventor (to Army) Filed 14 May 1984 23 p
(AD-D011453; US-Patent-Appl-SN-610148) Avail: NTIS HC A02/MF A01 CSCL 17/2

Enhanced availability and survivability of communications between geographically remote locations with a minimum of redundancy of transmission facilities and media is provided by a survivable bus network capable of providing continued interprocessor or other communications in the event of multiple bus outages. It consists of multiple busses, bus isolation device (BIDs) and two types of network interface processors (NIPs). The BIDs electrically isolate bus segments on either side of a connection so that if a fault occurs only the segment containing the fault will be affected. The first type of NIP connects to one bus and performs the usual function of providing an electrical and software interface between the network and one or more subscriber processors. The second type is a bridge which performs these same functions but connects to two busses and has the capability to transfer traffic as it appears on either bus to the other. The network provides increased survivability in the event of failed segments but does not entail the expense of a fully redundant system. Author (GRA)

N85-19263# Department of the Army, Washington, D. C.
AN ELECTRONICALLY CONTROLLED ARRAY FOR SIMULATION OF PASSIVE TARGET/BACKGROUND SIGNATURES AT MILLIMETER WAVELENGTHS Patent Application
A. H. Green, Jr. and G. J. Rast, Jr., inventors (to Army) Filed 28 Nov. 1984 16 p
(AD-D011456; US-Patent-Appl-SN-675916) Avail: NTIS HC A02/MF A01 CSCL 17/9

A system is described for an electronically controlled array for the simulation of passive signatures and noise at millimeter wavelengths. The system can simulate passive background signatures and also superimpose radiation intensity variation to simulate either moving or stationary passive signatures of targets over or within the background. A single, non-varying source of millimeter waves provides the non-coherent radiation for illumination that is required for simulating passive signatures. A controlled array variably controls radiation intensity at each illumination point of the array. The non-varying source is concentrated at the focal axis of a parabolic reflector, providing a plane wave-front of radiated energy. Author (GRA)

N85-19264# Department of the Air Force, Washington, D.C.
NOISE JAMMER DISCRIMINATION BY NOISE MODULATION BANDWIDTH Patent Application
C. D. Wise, inventor (to Air Force) Filed 7 Jun. 1984 15 p
(AD-D011473; US-Patent-Appl-SN-618287) Avail: NTIS HC A02/MF A01 CSCL 17/4

A method is described for distinguishing between multiple noise jammer sources having different noise modulation bandwidths. Noise signals are detected by a receiver having a bandwidth substantially the same as the bandwidth of the jammer noise source. The dwell time of the noise pulses formed by the receiver provides a means for determining the noise modulation bandwidth of a noise jammer source. GRA

N85-19265# Department of the Navy, Washington, D. C.
COHERENT RECEIVER PHASE AND AMPLITUDE ALIGNMENT CIRCUIT Patent Application
J. P. Hansen, inventor (to Navy) Filed 13 Nov. 1984 23 p
(AD-D011487; US-Patent-Appl-SN-670082) Avail: NTIS HC A02/MF A01 CSCL 17/2

A device for aligning the phase and amplitude of a quadrature-detected coherent two-channel receiver utilizing a mixer in each channel comprising a circuit for providing a sweep frequency signal to each receiver channel; a circuit for detecting the envelopes of the receiver channels at the outputs of the mixers and determining the voltage difference between the envelopes; and a circuit for controlling the amplitude level in one of the receiver channels in accordance with this voltage difference. Simultaneously, the output signals from the two mixers are added with the resulting sum signal being envelope-detected, and also subtracted from each other with the resulting difference signal being envelope-detected. The sum envelope and the difference envelope are subtracted from each other to generate a control signal for controlling the phase of one of the mixer local oscillator signals to ensure that the mixer local oscillator signals are in phase quadrature. GRA

N85-19266# Department of the Air Force, Washington, D.C.
CONFORMAL PHASED ARRAY ANTENNA PATTERN CORRECTOR Patent Application
J. D. Antonucci, inventor (to Air Force) Filed 15 Nov. 1984 14 p
(AD-D011489; US-Patent-Appl-SN-671393) Avail: NTIS HC A02/MF A01 CSCL 17/9

The present invention relates to radar antenna systems and particularly to a pattern corrector for a conformal phased array monopulse antenna system. In certain monopulse radar applications, such as aboard aircraft, it becomes advantageous to mount a phased array antenna onto the curved exterior surface of the host vehicle. Such a conformal phased array antenna, however,

produces a distorted radiation pattern when the beam is scanned off of broadside. GRA

N85-19267# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT OF THE FREQUENCY BANDS FROM 17.7-40.5 GHz
K. Nebbia and N. Schroeder Aug. 1984 120 p refs
(PB85-125748; NTIA/REPORT-84/155) Avail: NTIS HC A06/MF A01 CSCL 17B

A spectrum resource assessment (SRA) of the frequency bands from 17.7 to 40.5 GHz is described. Included is information on rules and regulations, allocations, technical standards, current and proposed usage, and planning and coordination procedures. Major issues concern Government and non-Government telecommunications requirements, and planning and coordination procedures for these bands. Recommendations include retaining the current allocation tables and planning structure, making changes to assignment procedures and documenting long range plans. Author (GRA)

N85-19268# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT OF THE 1530-1660.5 MHz BAND
J. S. Levy Sep. 1984 68 p
(NTIA/REPORT-84/160) Avail: NTIS HC A04/MF A01 CSCL 17B

A spectrum resource assessment of the 1530 to 1660.5 MHz band is documented. The impact of allocation changes resulting from the WARC-79 are addressed. Information is included on allocations, frequency assignments, system characteristics, and spectrum measurements made with the RSMS van. A review of previous analyses was conducted. No major spectrum management problems involving the major systems presently operating in, or firmly planned for, this band are identified. Author (GRA)

N85-19269# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
PROPAGATION INFLUENCES ON DIGITAL TRANSMISSION SYSTEMS: PROBLEMS AND SOLUTIONS
John Blythe, ed. Loughton, England Oct. 1984 510 p refs In ENGLISH and FRENCH Symp. held in Athens, 4-8 Jun. 1984
(AGARD-CP-363; ISBN-92-835-0367-8) Avail: NTIS HC A22/MF A01

Papers and session summaries are presented which examine propagation effects having an influence on the performance of digital systems, including: noise levels, and system sensitivities to noise; man-made interference types and system sensitivities to man-made interference; and multipath effects; dispersion, fading rates, medium coherent bandwidth, channel models, and system sensitivities to these. Systems designed to counter these effects, including the various kinds of adaptive systems are also reviewed. For individual titles, see N85-19270 through N85-19308.

N85-19270# Siemens A.G., Munich (West Germany).
LIMITS OF THE PROPAGATION MEDIUM WITH RESPECT TO DIGITAL SIGNAL TRANSMISSION
Ernst W. Lampert *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 15 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01 CSCL 20N

The effects of the propagation medium are more pronounced in digital communication systems than in analogue ones, in particular when considering single channel systems. The quality parameters: bit-error-rate and link availability are affected not only by the received signal level but also by multipath propagation which may result in frequency selective fading or just in a too low signal level when changing the location in a mobile system or signal fading when the medium is time variable. While fading decreases the signal to noise ratio of links causing short or long terms outages, frequency selective fading causes intersymbol interference and distortion which results in classical systems in an irreducible error rate. Propagation effects for each frequency region from HF to EHF are discussed individually. For LOS-links the typical multipath geometry is presented and data for coherence bandwidth and fading duration are given. Meteor burst scatter can only be used in digital ARQ-systems. It is shown that present systems are rather power limited than distortion limited. In digital troposcatter systems selective fading due to the mutual differential delay of the signal components is a limiting factor especially in digital systems. Delay power spectra are discussed with respect to geometry and layer structure. M.G.

N85-19271# Hellenic Navy Technology Development Office, Athens (Greece).
PROPAGATION OF WIDE BANDWIDTH SIGNALS IN A TROPOSPHERIC DUCTING SYSTEM
Nikolaos K. Uzunoglu *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 12 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The propagation properties of wide bandwidth signals transmitted through a tropospheric ducting medium are examined analytically. A flat earth model with a perfect surface conductivity (sea surface) is taken. The refractive index profile n(h) is assumed a stepwise function of the height h. Horizontal and vertical polarized waves are treated in parallel by employing similar procedures. The corresponding boundary value problems are solved by using spectral representations for the primary antenna and induced fields. Guided and radiated mode contributions are then computed by applying approximate asymptotic integration techniques under a continuous wave (CW) excitation. The behavior of wide bandwidth signals propagating in a tropospheric duct is examined in terms of the inverse Fourier transformation of the CW field expressions. Several geometries are considered such as both transmitting and receiving antennas being inside the tropospheric waveguide or the opposite. Particular attention is given to the case when the communication path crosses the waveguide ceiling. In order to determine the influence of the multipath propagation, occurring inside the ducting medium, into a real communication link a phase shift keying modulation is considered. Numerical results are given for several tropospheric ducting media in terms of the bit error rate. M.G.

N85-19272# Bell Telephone Labs., Inc., Holmdel, N. J.
DIGITAL DATA COMMUNICATIONS OVER MICROWAVE RADIO CHANNELS
J. Salz *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 7 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

A major contribution to system outage in a terrestrial digital radio channel is deep fading of the frequency transfer characteristic, which in addition to causing a precipitous drop in received signal-to-noise ratio also causes signal dispersion that can result in severe intersymbol interference. Because the temporal variation of the channel is slow compared to the signaling rate, the information theoretic channel capacity and the efficiency index in bits/cycle can be viewed as random processes. Based on an established mathematical model for fading channels, the probability distribution of channel capacity and the distribution of efficiency indices for different communications techniques are estimated. A crucial obstacle to achieving these rates is the nonlinear distortion introduced by power amplifiers. A method for coping with this nonlinear distortion is also described. M.G.

N85-19273# Rome Air Development Center, Griffiss AFB, N.Y.
EHF AIR-TO-AIR COMMUNICATIONS
Peter N. Edraos *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 16 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The use of the extremely high frequency (EHF) oxygen-absorption frequency band for low-detectability air-to-air communications has been proposed at various times; the development

of such an EHF short-range air-to-air communications system is considered. The protection to the communications system is provided by the cumulative oxygen absorption characteristics of the atmospehre. System considerations are dealt with parametrically; the effects of aircraft velocity, altitude, antenna coverage, transmitter power, and so forth, are discussed with regard to impact on range, frequency, acquisition time, data rate, etc. A baseline system is submitted; link power budget calculations are made for the baseline, resulting in estimates for maximum allowable attenuation; system performance is assessed for a number of situations. Emphasis is on communications and the problems involved in the design and implementation of an EHF air-to-air digital voice system, concentrating on the propagation influences and constraints. M.G.

N85-19274# British Telecom Research Labs., Ipswich (England).
PROPAGATION INFLUENCES ON THE PERFORMANCE OF A REDUCED BANDWIDTH QUADRATURE PHASE SHIFT KEYED DIGITAL RADIO SYSTEM
J. E. Doble *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 7 p (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

British Telecom is running a field trial of a spectrally efficient (4.2 bits/Hz) reduced bandwidth quadrature phase shift keyed digital radio system for the lower 6 GHz and 4 GHz bands in a part of the UK that is subject to above average multipath activity. Some of the observations made during a two-year period are described together with the improvements made to the antennas and the methods likely to be used in predicting system performance in other locations. The current method of predicting multipath fading is examined and found wanting in its application to digital system planning. An alternative is put forward and an example of its use is given. R.S.F.

N85-19275# Boston Univ., Mass. Dept. of Astronomy.
EQUATORIAL TRANSIONOSPHERIC PROPAGATION CONDITIONS AFFECTING DIGITAL COMMUNICATIONS
Jules Aarons *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 13 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The strength, morphology, and spectral characteristics of trans-ionospheric transmissions were assessed in order to mitigate fading in trans-ionospheric digital systems. The morphology and power spectra of equatorial scintillations are discussed along with fading characteristics relevant to digital communications. Solar flux levels are related to irregularities in the F layer of the ionosphere. R.S.F.

N85-19276# General Electric Co., Syracuse, N.Y.
PROPAGATION EFFECTS ON THE DOPPLER FREQUENCY SHIFT OF SATELLITE TRANSMISSIONS
George H. Millman and Michael C. Arabadjis *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 15 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The refraction phenomenon in the troposphere and the ionosphere causes an error in the Doppler frequency shift of radio transmissions emitted from a nonstationary satellite and received on the ground. Estimates are made of the Doppler error for various atmospheric and solar-geophysical conditions and are applicable for frequencies in the VHF to UHF range and above. The Doppler error imposed by the troposphere is directly proportional to frequency while, in the case of the ionosphere, the error is approximately inversely proportional to the frequency and approximately directly proportional to the vertical electron content. Under average tropospheric conditions, the tropospheric contribution to the Doppler error is predominant for frequencies on the order of 400 MHz and above. Below about 400 MHz, the ionospheric refraction effects are prevalent. The Doppler effects can be compensated for, to some extent, when the angular bending and the space vehicle velocity are known. Estimates of the angular bending due to the troposphere can be made to a fair degree of accuracy, from measurements of the surface refractivity. For the ionosphere, the vertical electron content data can be used for the estimation of the refraction angle error. R.S.F.

N85-19277# Thomson-CSF, Levallois-Perret (France).
INFLUENCE OF PROPAGATION IN DIGITAL WIRELESS BEAM, MICROWAVE LINKS [INFLUENCE DE LA PROPAGATION DANS LES FAISCEAUX HERTZIENS NUMERIQUES]
J. Bursztejn *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 17 p refs In FRENCH (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Methods are presented for determining the parameters which permit the prediction of the quality of tropospheric scattering and line of sight microwave links. Wireless beam, microwave links with tropospheric scattering are considered based on experiments for determining the coherence band which is the essential parameter for digital transmission by tropospheric scattering. The effects of propagation difficulties in line of sight links are discussed with focus on depolarization and selective fading. Experimental results are given which permit calculating the sensitivity of equipment and predicting the quality of the links. Transl. by A.R.H.

N85-19278# Dutch Post Office, Dr. Neher Lab., Leidschendam.
THE IMPACT OF PROPAGATION EFFECTS ON THE DESIGN OF HIGH CAPACITY DIGITAL MICROWAVE LINKS IN THE 18 GHz FREQUENCY BAND **c33**
L. vanderHoek, A. Mawira, and J. Neesen *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 18 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Propagation effects cause performance impairments in high capacity radio relay links. A transmission model is presented which allows the prediction of system performance during fading conditions. This model includes propagation and equipment parameters, the values of which depend on the local radio-meteorological environment and the actual equipment characteristics. Propagation and communication experiments were carried out, allowing the prediction of system performance in its operational environment at frequencies around 18 GHz. In particular, the effects on the bit-error-ratio as caused by attenuation and cross-polarization due to rain and multipath are discussed. R.S.F.

N85-19279# Institute for Telecommunication Sciences, Boulder, Colo.
A REVIEW OF ATMOSPHERIC MULTIPATH MEASUREMENTS AND DIGITAL SYSTEM PERFORMANCE
Robert W. Hubbard *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 18 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The effects of multipath propagation on digital communication systems are discussed. Recent literature and experiments are reviewed for information that either describes or defines the phenomenon in terms of the propagation media itself. A morphology is presented which is intended to produce better understanding and improved performance of digital radio systems. The technical posture for the digital troposcatter channel up to the 1980s is summarized. R.S.F.

N85-19280# CyberCom Corp., Arlington, Va.
UHF COMMUNICATIONS THROUGH FORESTED PROPAGATION CHANNELS
Allan Schneider *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 19 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

A stochastic radio wave propagation model useful for assessing the effects of forests and other vegetation upon communications signals in the UHF band is described. Considering the forest as a time-irvariant ensemble of randomly positioned and oriented discrete canonical scatterers, the behavior of the mean scattered

radio wave in the forest is reviewed. Actual statistical data describing trunk and leaf characteristics are discussed and are used in several numerical examples. The model is then used to derive the specific attenuation attributable to the mean field in tree trunks and leaves. A more realistic series of models is also introduced which treat the forest as a stratified continuous medium. The models are used to develop the resultant field occurring as a consequence of combined direct, reflected, and lateral wave components and ground reflections. The analysis is extended through Fourier transform techniques to derive the effects important to communications systems, including pulse response and two-frequency correlation functions. R.S.F.

N85-19281# Lowell Univ., Mass. Center for Atmospheric Research.
MULTIPATH AND DOPPLER OBSERVATIONS DURING TRANSATLANTIC DIGITAL HF PROPAGATION EXPERIMENTS
Bodo W. Reinisch, Klaus Bibl, Mukhtar Ahmed (GTE Sylvania, Inc., Needham Heights, Mass.), Haim Soicher (Army Communications Electronics Command, Fort Monmouth, N.J.), Frank Gorman (Army Communications Electronics Command, Fort Monmouth, N.J.), and Jean Claude Jodogne (Inst. Royal Meteorologique de Belgique, Brussels) *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 11 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Digital HF transatlantic propagation experiments between two nodes at Dourbes, Belgium, and Needham, MA, using identical digisonde 256 systems became operational in October 1983. Adaptive two way sounding and real time channel evaluation studies are to be conducted among the network's nodes. Presently, the Dourbes station is transmitting 10 kW pulses using a horizontal rhombic antenna while the Needham station uses a long-periodic antenna for both transmission and reception. Amplitude and Doppler shifts of different multipath modes were measured during magnetically quiescent and disturbed periods for the first month of operation. The pulse modulation enables clear separation and identification of the multihop paths. Real time discrete Fourier transforms determine the Doppler shifts imposed by height changes of the reflecting ionospheric layers. A comparison of the observed MUF's of the dominant 2F mode with the MUF's predicted by the IONCAP model show the latter to be about 20 to 30% higher. R.S.F.

N85-19282# Leicester Univ. (England). Dept. of Physics.
AN IONOSPHERIC MODE DETECTION SYSTEM FOR HF COMMUNICATIONS APPLICATION
T. B. Jones and P. L. Hayhurst *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 12 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The injection of sounding pulses into a communications channel was used as a technique for mode detection. This pulse sounding procedure was shown to reliability recognize propagation modes within the following limits. The maximum time resolution of the system is approximately 0.5ms between arriving pulses. Thus modes with nearly equal times of flight are not easily resolved. The majority of errors recorded were due to random noise. The pulse sounding system is a low cost aid to HF communications which enables the structure of signals received via multiple propagation paths to be evaluated. From this information an estimate of the expected fading induced error rate is obtained by comparing the relative amplitudes of the active modes. The measured relative time delays between modes provide an indication of the maximum data transmission rate possible before bit errors occur due to multipath propagation. Moreover, the pulse sounding signal can provide the (S/N) ratio for a given channel from which error rate estimates can be based. R.S.F.

N85-19283# Deutsche Bundespost, Darmstadt (West Germany).
WIDEBAND LINE-OF-SIGHT CHANNEL MEASUREMENTS AND SIMULATION: APPLICATION TO DIGITAL RADIO LINKS
R. Valentin and K. Metzger *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 11 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The performance of high-capacity digital radio links which is impaired by frequency-selective fading during multipath propagation, even if the signal-to-noise ratio is adequate was examined. The amplitude and group delay distortions were measured in a 40-MHz bandwidth at 4 GHz on a line-of-sight path. It is shown that the complex transfer function H(Omega) of the propagation channel can be well approximated by a two-ray model. The influence of two-path fading can be estimated if the dependence of the notch depth versus the deviation between the notch frequency and the carrier frequency f sub c for a fixed bit-error rate is known. Perfect Nyquist pulse shaping was assumed and the effects of timing and carrier recovery circuits during two-path propagation were considered. The comparison with the measured signature showed a small degradation which is attributed to modem imperfections. A two-channel simulator for two-path fading was developed, where the indirect wave which was delayed by tau = 6.3 ns relative to the direct wave was Rayleigh-distributed. By variation of the parameter-K which describes the power ratio between the indirect and the direct wave, it is possible to simulate different fading processes. The improvement by the use of an inphase diversity combiner is investigated for different values of the correlation coefficient between the two channels. E.A.K.

N85-19284# Technische Hogeschool, Delft (Netherlands). Microwave Lab.
DESIGN CRITERIA FOR LIMITED SCAN ANTENNAS AT DIGITAL MICROWAVE LINE OF SIGHT LINKS
L. P. Ligthart *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 7 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The angle diversity technique for multipath fading reduction which uses limited scan antennas is examined. Antenna design criteria for this purpose are investigated under the assumption that only group delay requirements instead of fading depth are the determining factors to fulfill bit error ratio (BER) specifications. In a two-way fading model the maximum group delay time difference is in first approximation equal to the ratio between the minimum received signal strength and the path delay time difference. It is known that group delay time differences are dependent on the worst BER and the modulation system. The path delay time difference and the angles of arrival are calculated in a spherical propagation model. To come to a design procedure independent of refractive index profiles it is assumed that each ray is influenced along its path by a constant refractive index gradient. Combining the results from the spherical propagation model and the group delay requirements allows the computation of the maximum fading depth for given angles of arrival. The pattern envelope of limited scan antennas around the angles of interest are derived under the assumption that infinite deep fading occurs if no diversity technique is used. E.A.K.

N85-19285# Norwegian Defence Research Establishment, Kjeller.
A COMPARISON BETWEEN PREDICTED AND MEASURED PROPAGATION LOSS IN THE VHF/UHF RANGE IN RUGGED TERRAIN
K. Besserudhagen, N. Klippenberg, and M. Norland *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 9 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Data from field measurements were compared with predictions based on the Longley-Rice model applied to individual path profiles. The field experiments were designed to reflect the communications deployment situation experienced by group forces. It is indicated that the value of accurate transmission loss calculations is doubtful, particularly in rugged terrain. Strong local variations introduce significant spread in the observed field strength at a given location. The median prediction error was 13 dB at 390 MHz and 20 dB at 34.5 MHz in a moderately rugged area. It is believed that reflections from objects in the horizontal plane are an important contributing

factor in reducing prediction reliability at VHF and UHF. The possibility of modelling such phenomena is discussed in a context of tactical applications. E.A.K.

N85-19286# Telettra Telefonia Elettronica e Radio S.p.A., Vimercate (Italy).
SOME PROPAGATION EXPERIMENTAL RESULTS ON PROTECTION TECHNIQUES FOR LINE-OF-SIGHT DIGITAL SYSTEMS
F. Fabbri *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 17 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The main causes of distortion produced by propagation on digital signals, the protection systems generally adopted to contrast such a distortion and some methods used for the calculation of the digital performance are examined. The most significant results obtained from field measurements, especially concerning the efficiency of the protection systems are described. An overall layout of the current possibilities of high capacity digital transmission over radio links is given on the basis of theoretical and experimental results. E.A.K.

N85-19287# Centre National d'Etudes des Telecommunications, Lannion (France).
A SYSTEM FOR MEASURING THE CHARACTERISTICS OF THE IONOSPHERIC CHANNEL BY DIGITAL TRANSMISSIONS [SYSTEME DE MESURE DES CARACTERISTIQUES DU CANAL IONOSPHERIQUE]
Y. M. LeRoux, L. Bertel, J. P. Jolivet, P. Lassudrie-Duchesne, and H. Rouault *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 17 p refs In FRENCH; ENGLISH summary (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The increase of digital transmission rates in the decametric range, by adaptative modems was examined. The ionospheric channel is defined for its rapid fluctuations, and its slower time evolutions. The measuring system is designed to provide for two types of ionospheric medium studies. The first study estimates the main parameters of the channel transfer function, with an update process in the order of 10 milliseconds. With such a cyclic-rate analysis, constraints of data recording restrict the length of the observations. The system gives information about the channel time-variation characteristics over intervals of a few tens of seconds, and thus allows a survey of the average behavior of the channel in a quasi-continuous manner. The first results obtained during an experiment at vertical incidence to validate equipment and measurement technique are presented. E.A.K.

N85-19288# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
MEASUREMENTS OF PROPAGATION AT 900 MHz IN AN URBAN ZONE FOR ESTABLISHING A DIGITAL RADIOMOBILE SYSTEM [MESURES DE PROPAGATION EN ZONE URBAINE A 900 MHz POUR L'ETABLISSEMENT D'UN SYSTEME RADIOMOBILE NUMERIQUE]
Christopher Havel and Alain Maloberti *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 8 p refs In FRENCH (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

An experiment was conducted to study UHF (900 MHz) propagation in Paris and its outskirts. Measurements of the pure carrier field can be used to engineer a cellular communication system with digital mobile units. Radio propagation with mobile units is analyzed; requirements and measurements are defined. Results are compared with those obtained using a model proposed in the literature. The decrease of the field follows a D sup - alpha laws, with alpha 3.5. Good correlation can be established with an 8 dB normal log variation law for the effects of masks and a Rice law for rapid fading. Two applications of these measurements are examined. Transl. by A.R.H.

N85-19289# GEC-Marconi Electronics Ltd., Chelmsford (England). Communications Research Lab.
MEASUREMENTS AND PREDICTIONS OF MULTIPATH DISPERSION FOR TROPOSCATTER LINKS
R. Larsen *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 9 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Multipath dispersion measurements made on several 4.5 GHz paths in the United Kingdom are presented. Beamwidth and scatter angle dependence and several features of dispersion in angle and space diversity are discussed. These measurements and other from the literature are compared with predictions of dispersion. The predictions considerably underestimated the measured dispersion, but the inclusion of a beam broadening factor in the calculations gave a significant improvement in accuracy. Author

N85-19290# Kansas Univ. Center for Research, Inc., Lawrence. Telecommunications and Information Systems Lab.
DIGITAL SIMULATION OF COMMUNICATIONS CHANNELS: AN OVERVIEW
J. C. Holtzman and K. Sam Shanmugan *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 8 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Improved characterization of the propagation channel is required in the simulation of wideband communication systems. Some of the popular channel models that are currently in use are discussed, as well as their capabilities and limitations. One major shortcoming of these models is the way in which they are most often used to calculate transmission losses at a single frequency, neglecting the frequency and time dependency of the various propagation phenomena. A tapped delay line model with time varying tap gains is proposed as the generic simulation model for propagation channels. It is shown how this model can be used to analyze the effects of gaseous absorption and dispersive refraction of moist air at microwave frequencies. R.J.F.

N85-19291# Institute for Telecommunication Sciences, Boulder, Colo.
LOS MICROWAVE CHANNEL SIMULATION: A SURVEY OF MODELS, REALIZATIONS AND NEW CONCEPTS
James A. Hoffmeyer and William J. Hartman *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 17 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01 CSCL 20N

Channel simulation concepts and recent work in line of sight channel modeling and the hardware realization of these models in a channel simulator are reviewed. A new approach in which the channel simulator is realized at RF rather than at IF is discussed. The need for a standard performance measure for digital radios is discussed. Although bit-error rate (BER) is frequently used, this measure does not facilitate comparisons between tests conducted by different researchers because of differences in the ways that BER statistics are accumulated. The use of the synchronous error second and other performance measures are addressed. R.J.F.

N85-19292# National Aerospace Lab., Amsterdam (Netherlands).
SIMULATION OF THE PERFORMANCE OF ADAPTIVELY CONTROLLED NAVSTAR ANTENNAS IN BATTLEFIELD SCENARIOS
F. Klinker and O. B. M. Pietersen *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 11 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

As the tool for the determination of the requirements for threat suppression and the performance of adaptively controlled antennas in electronic warfare conditions, the ANABASIS computer program was developed. The signal propagation model and the weight vector calculation are discussed. Some examples of simulation results are presented. The Navstar Global Positioning System (GPS) is a navigation system developed by the US Department of Defense. Its main purpose is to provide highly

accurate positioning and timing data to military users. Although the use of the spread spectrum technique in GPS provides for a reasonable protection against jamming or other interference signals, one can increase the immunity to a great extent by using adaptive antennas. It depends on the expected scenarios, including jammers, if any suppression by antennas is necessary. R.J.F.

N85-19293# York Univ. (England).
AN H.F. SIMULATOR FOR USE WITH REAL TIME CHANNEL EVALUATION SYSTEMS
J. Dawson *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 15 p (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

A high frequency (HF) simulator constructed at York University as an off-air test bed for an HF radio link using real time channel evaluation aided frequency selection is discussed. The simulator implements the basic channel model proposed by Watterson et al [Watterson 69a] with the addition of several novel features applicable to real time channel evaluation systems: rapid selection of channel parameters from stored sets; a realistic and repeatable interference simulation; and time variable channel statistics. A brief resume of channel modelling and atmospheric noise is given. R.J.F.

N85-19294# Centre National d'Etudes des Telecommunications, Lannion (France). Dept. MER/TSF
THEORETICAL STUDY OF A DYNAMIC SIMULATOR OF SELECTIVE FADING FOR DIGITAL, WIRELESS BEAM MICROWAVE LINKS [ETUDE THEORIQUE D'UN SIMULATEUR DYNAMIQUE D'EVANOUISSEMENTS SELECTIFS POUR FAISCEAUX HERTZIENS NUMERIQUES]
A. Bouidene and P. Vandamme *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 13 p refs In FRENCH; ENGLISH summary (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

A channel simulator for line-of-sight digital radio systems is presented. The basic principle is to reproduce channel transfer functions measured in the field during multipath propagation activity, by driving a complex linear transversal filter with precomputed data. The criterion used for calculating the values of the filter taps for each transfer function is the minimum mean square error criterion. It is shown that a thirteen-taps complex transversal filter with a period of 70 MHz in the frequency domain leads to accurate simulations of selective fading transfer functions in a 50 MHz bandwidth. Technological features are investigated. Effects of the accuracy in the delays implementation and of the tap-weight quantification are particularly analyzed. Author

N85-19295# Signatron, Inc., Lexington, Mass.
ADAPTIVE SIGNAL PROCESSING FOR RADIO COMMUNICATIONS
P. Monsen *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 16 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

A tutorial examination of adaptive processors for radio communication applications is presented. The general form of adaptive equalizers and Maximum Likelihood Sequence Estimators is discussed. The method of determining the performance of an adaptive equalizer in a fading channel environment is summarized. A simple example illustrates how implicit diversity is realized by channel adaptation. Methods of adaptation including Kalman filter techniques are presented along with performance results of practical fast adapting systems. The use of channel adaptation with error correction coding is also examined and practical results presented. These results show that most of the fading effect can be eliminated when there is no restriction on channel time delay. Multiple channel adaptive processors which eliminate correlated interference are also discussed. Performance results for a tropospheric scatter application are predicted and compared with laboratory measurements on a real system. Methods of fast adaptation of these multi-channel processors are discussed. Author

N85-19296# Norwegian Defence Research Establishment, Kjeller.
FAST SYNCHRONIZATION MODEL FOR UHF SPREAD-SPECTRUM COMMUNICATION SYSTEM
Reider Skaug and Hermund Olaisen *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 8 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Communication systems employing wideband digital techniques and special modulation methods are presently being developed to support the requirements for speed and volume as well as survivability and efficiency in tactical battlefield data distribution. The transport of information in a battlefield scenario presents considerable problems where both the laws of physics and enemy and own actions are limiting factors. Introduction of spread spectrum equipment able to withstand the electronic warfare threat has often been impracticable in tactical systems with push-to-talk signalling. One of the reasons has been synchronization difficulties. Rapid and effective synchronization of spread spectrum systems often requires matched filter processing in the receiver. The realization of such filters presents technological problems for high data speeds. Surface acoustic wave (SAW) technology has, however, been very promising in this connection. A spread spectrum modem utilizing state of the art SAW technology to process the communication signals is discussed. The system operating at UHF is optimized for push-to-talk operation with a synchronization time of 20 microsec and offers data speeds up to 100 kbit/sec. With a processing gain of approximately 30 dB, the radio modem is also able to resolve and reject multipaths on the order of 10 nsec. It is thus expected to avoid certain selective effects due to multipath which are usually encountered in narrowband communication systems. B.W.

N85-19297# Selenia S.p.A., Rome (Italy).
A TECHNICAL SOLUTION TO FADINGS IN TACTICAL SATELLITE DIGITAL TRANSMISSIONS
Giacinto Losquardo and Andrea Lorenzoni (Centro Consultivo Studi e Ricerche Dell'Aeronautica Militare) *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 8 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Tactical satellite communication systems may provide service to high performance aircrafts employing antennas with relatively wide beamwidths. Unfortunately, the fading and multipath phenomena could strongly influence the capability of point to point data transmission. In order to overcome the problem of the design of a coding/mo-demodulation structure, and to determine the actual link margin, an analysis and a simulation of a multipath channel has been performed. The performance gains that are achieved with the use of a suitably wide bandwidth modulation and with three different theoretical fading models are shown. The problem of the bandwidth spreading has been related to the aircraft height and to the geometry of the multipath model. A solution to the problem of multiplexing of several wideband signals, over a repeater bandwidth, proposed and the performances of a receiver, based on a FFT spectra analyzer, are illustrated. The simulation to the problem of multiplexing of several wideband signals, over a repeater bandwidth, was proposed and the performance of a receiver, based on a FFT spectra analyzer, are illustrated. The simulation results confirm that, the FFT based receiver allows the soft decision demodulation of one or several simultaneous channels, with performances that are very close to the ones given by the optimal receiver for orthogonal codewords; moreover, the FFT solves, elegantly, the problem of Doppler shifts even in presence of fadings and with the capability to track the satellite signal even for maneuvering aircraft. B.W.

N85-19298# Rome Air Development Center, Griffiss AFB, N.Y.
TIME AND SPACE DOMAIN FILTERING FOR IMPROVED HF COMMUNICATION
Richard N. Smith and Randolph L. Moses (Virginia Polytechni

Inst. and State Univ.) *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 15 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

High speed data transfer has until recently been generally unattainable over HF channels because of the highly disturbed nature of the channel. The development of real-time signal processors has done much to mitigate effects of channel disturbances, making it possible to substantially increase throughput. Data rates as high as 9600 bits per second can be achieved by implementing signal processors as adaptive channel equalizers. This recent increase in data rates has rendered feasible HF spread spectrum communication systems. Spread spectrum systems are attractive in many applications because they are resistant to narrowband interference. However, channel equalizers necessary for high data rates are susceptible to narrowband interference. Spatial or temporal prefiltering has commonly been employed to prewhiten the received data, providing improved equalizer performance. The more popular one-dimensional techniques for temporal and spatial prewhitening of HF communication signals are reviewed. Also, combined space-time prewhitening techniques are proposed. Algorithms for designing and implementing these two-dimensional whitening filters are presented. Advantages and disadvantages of the two design strategies are discussed. Particular attention is focused on system performance, computational requirements, and cost. Computer simulated results for these signal processing algorithms are presented. B.W.

N85-19299# Rome Air Development Center, Griffiss AFB, N.Y.
OVERVIEW OF RADC ADAPTIVE ANTENNA DEVELOPMENTS FOR COMMUNICATIONS Abstract Only
J. A. Graniero, C. J. Luvera, and J. R. Periard *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 2 p (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Adaptive Antennas are a key technology in providing reliable communications in an interference environment. Key developments at the Rome Air Development Center (RADC) in areas of adaptive algorithms, experimental processors and test and evaluation are described. The developments are aimed at improving adaptive antenna performance such as: null depths over bandwidth and in high multipath, convergence speeds and processor size, weight and cost. A new test bed at RADC called the Flexible Adaptive Spatial Signal Processor (FASSP) is also described. The FASSP provides the capability of comparative evaluation of various adaptive algorithms in either or both of two modes: full digital beamforming/nullsteering or a hybrid mode with analog weighting and digital weight computation. B.W.

N85-19300# LMT Radioprofessionelle, Boulogne-Billancourt (France).
ASYNCHRONOUS TRANSMISSION WITH STRONG SPECTRAL SPREAD [TRANSMISSION ASYNCHRONE A FORT ETALEMENT DE SPECTRE]
M. Schilliger and C. Leloup *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 14 p refs In FRENCH (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Resistance to signal detection and interception and resistance to interference and mixing are advantages of spread spectrum transmission in military communications. The construction of the emitter and receiver permitted testing an asynchronous radio link with a digitalization of speech by delta code, and also facilitated the obtaining of measurements. Spectrum spreading was achieved on a 80 MHz band by means of pseudo-random sequences coded in binary orthogonal keying using P.S.K. or M.S.K. modulation. Demodulation at reception was achieved in an asynchronous mode by a double piezoelectric surface acoustic wave convolutor operating at a frequency on the order of 400 MHz. Each convolutor was fed, partly by the signal received, and partly by a replica of the signal expected, at the same frequency, and with the same code inversed in time. Transl. by A.R.H.

N85-19301# York Univ. (England). Dept. of Electronics.
A REVIEW OF TRANSMISSION AND CHANNEL EVALUATION TECHNIQUES FOR DIGITAL COMMUNICATION SYSTEMS
M. Darnell *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 18 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The advantages and disadvantages of digital modes of transmission are reviewed. A brief survey of the main propagation characteristics of the different types of radio systems is presented, with attention being drawn to the factors which influence the choice and performance of digital transmission techniques. The most widely used digital transmission techniques are then discussed and their applicability to various radio frequency bands considered. Finally, channel evaluation techniques yielding models of the propagation and interference environments are described and the manner in which they can be employed to enhance the reliability of digital communication systems is indicated. Author

N85-19302# Paris-Sud Univ., Cachan (France). Lab. d'Etude des Transmissions Ionospheriques.
A MODEM WITH PSEUDO-ORTHOGANAL CODES: EXPERIMENTAL RESULTS [MODEM A CODES PSEUDO-ORTHOGANAUX: RESULTATS EXPERIMENTAUX]
F. Chavand, D. Desage (Telecommunications Radioelectriques et Telephoniques), C. Goutelard, and J. P. vanUffelen *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 14 p refs In FRENCH (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The decametric ionospheric channel is characterized by the existence of multiple paths which introduce selective fading and intersymbolic distortions. Modems with slow cadence can solve the problem of intersymbolic interference, but are sensitive to selective fading. On the other hand, modems with rapid cadence are sensitive to intersymbolic interference, but have little sensitivity to selective fading. A modem using pseudo-orthogonal codes is presented which effects a series transmission while preserving good protection against intersymbolic distortions. The characteristics of these codes, which constitute optimal codes, are reviewed and techniques used in the modem are described. A simulator was used to measure the characteristics of the modem under propagation and perfectly defined mixing conditions. Tests on a real link permitted comparison of the performance of a modem with pseudo-orthogonal codes with that of a noncoded modem with the same output. The gain contributed by coding is demonstrated. Transl. by A.R.H.

N85-19303# Paris-Sud Univ., Cachan (France). Lab. d'Etude des Transmissions Ionospheriques.
ERROR CORRECTION CODING FOR A SELF-ADAPTIVE MODEM: THEORETICAL AND EXPERIMENTAL RESULTS [CODAGE CORRECTEUR D'ERREURS POUR MODEM AUTO DAPTATIF RESULTATS THEORIQUES ET EXPERIMENTAUX]
F. Chavand, C. Goutelard, and S. Harari *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 16 p refs In FRENCH; ENGLISH summary (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

An error correcting system designed for a 1200 bits/s self adaptive modem operating on the HF ionospheric channel is presented. Error statistics were analyzed by simulating a specific link whose characteristics had been measured previously by a HF backscatter probe. Some 30 millions of bits were processed which represent 27 different cases of propagation and scrambling. The coding system consists of a cascade of two codes: one corrects single error and small bursts (Reed Solomon codes); the other corrects long bursts of errors (Kasama code). The overall rate is 0.55. An error correcting simulation shows that least 10 -2 has been achieved. Limitations of these correction methods on such

systems are discussed. The total error was reduced by a factor equal to or greater than 100 in all cases. Author

N85-19304# Siemens A.G., Munich (West Germany).
A MICROPROCESSOR CONTROLLED PARALLEL MODEL WITH FDPSK
Holger E. Buding *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 13 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Within the frequency band of a HF-channel (3 kHz) the phase distortion is time variable and of a considerable size. In this environment it is advantageous to use FDPSK (frequency differential phase shift keying) for transmission instead of TDPSK (time differential phase shift keying). In FDPSK the information is transmitted as the phase difference between two synchronized carriers of different frequency. When they only have a small frequency difference (60 Hz) both are exposed to the same phase distortion of the HF-channel. With an appropriate demodulation method this phase error therefore can be cancelled. Measurements were done over two different HF links (40 km and 1200 km). Wideband dipole antennas and a frame antenna were used. The power output of the HF radio equipment was switchable between 70 and 400 watts. The measured error rates were in the order of magnitude 10 to 100. With the inclusion of the forward error correction (FEC) these error rates could be improved to 100 to 10000. B.G.

N85-19305# Telecommunications Radioelectriques et Telephoniques, Le Plessis-Robinson (France).
SERIAL DATA TRANSMISSION WITH LARGE OUTPUT ON THE HF CHANNEL [TRANSMISSION DE DONNES SERIE A GRAND DEBIT SUR CANAL HF]
J. P. vanUffelen IN AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 8 p refs In FRENCH (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

A modem is described that uses series transmission and a self-adaptive equalizer for correcting propagation distortions. The modem permits data transmission to a maximum output of 2400 b/s as well as in a continued mode with brief messages of one-second normal duration. Characteristics of the modem and the signal processing applied are discussed. Laboratory measurements of modem performance are compared with results of tests during simulated multipath propagation or with frequency shifting. Still other tests carried out on a 500 km link are discussed. Results were analyzed on a computer and are presented in the form of long- and short-term statistics. A.R.H.

N85-19306# Standard Elektrik Lorenz A.G., Stuttgart (West Germany).
FAST DATA AND VOICE TRANSMISSION FOR MOBILE SERVICES WITH HIGH IMMUNITY AGAINST MULTIPATH AND CO-CHANNEL INTERFERENCE
U. Langewellpott *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 6 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

A scheme for high rate data and voice transmission over multipath channels was developed and evaluated during the design of a wideband cellular mobile telephone and data system operating at 900 MHz. The transmission bandwidth in the order of 5 MHz is a consequence of the time division multiple access (TDMA) architecture was selected for cost savings and advantages in system organization. In TDMA time is divided into a contiguous stream of short time slots and individual channels consist of different subsets of time slots. All time slots use the same frequency, so no synthesizer is required. In addition, there is no need for a diplexer at the mobile because the transmit and receive time slots can be separated in time. For the same reason the base stations only need one transmitter and one receiver tuned to the transmit and receive frequency respectively. So the complexity is favorably reduced. The highest potential for cost savings stems from digital transmission which, in conjunction with a forecast number of more than one million subscribers, fulfills the prerequisite to low production cost. System organization is facilitated by the TDMA approach because the mobiles only need to be active during the short transmit and receive times slots and can easily monitor all surrounding base stations and decide to initiate hand-off to the one offering the best propagation conditions. Author

N85-19307# ANT Nachrichtentechnik, Backnang (West Germany).
NARROWBAND SPREAD SPECTRUM SYSTEMS
Karl Heinz Annecke and Manfred Ottka *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 11 p refs Sponsored in part by Bundesministerium fuer Verteidigung (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

The available military radio frequency bands are covered very densely by the already existing conventional systems and therefore the application of bandwidth widening procedures as antijam measures will be allowed only with small spreading factors within these RF-bands. The problems arising from the random code selection for spread spectrum systems with small spreading factors are discussed. The calculations show the dependence between certain statistical properties of classes of codewords and the number of codewords available in these classes. The bit error probabilities in case of jamming by white Gaussian noise, narrowband and CW-jammers are calculated in comparison with the error probability of the class of codewords with ideal correlation properties. Author

N85-19308# Standard Elektrik Lorenz A.G., Stuttgart (West Germany).
EFFECTIVE MILLIMETER WAVE TRANSMISSION UNDER SEVERE MULTIPATH CONDITIONS
U. Schulz and G. Hoefgen *In* AGARD Propagation Influences on Digital Transmission Systems: Probl. and Solu. Oct. 1984 7 p (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

Radio transmission on millimeter waves substantially suffers from multipath propagation as long as obstacles cannot be avoided in the propagation path. A system concept to overcome the fading problem will be presented. A broadband RF-transmission by chirp modulation and a respective correlation technique in the receiver are used. The transmission principle and the basic equipment functions are described. In addition, the results of the theoretical investigations on the receiver signal processing are presented. Author

N85-19309# Joint Publications Research Service, Arlington, Va.
WORLDWIDE REPORT: TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT
24 Jan. 1985 63 p refs Transl. into ENGLISH from various foreign articles
(JPRS-TTP-85-002) Avail: NTIS HC A04/MF A01

Research topics in the area of telecommunication are covered in this Worldwide Report. The development and design of traveling wave tubes and optical fibers from Japan are discussed. Chinese domestic satellite communications systems are also discussed. For individual titles, see N85-19310 through N85-19313.

N85-19310# Joint Publications Research Service, Arlington, Va.
TRAVELING WAVE TUBE FOR BROADCAST SATELLITES
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-002) 24 Jan. 1985 p 8 Repr. from Kyodo (Tokyo), no. 0643 GMT, 27 Dec. 1984 (For primary document see N85-19309 10-32)
Avail: NTIS HC A04/MF A01

The development of an advanced traveling wave tube (TWT) for broadcast satellites is described. TWT is an electron tube which functions at the heart of such satellites by amplifying and beaming microwaves to Earth. The new TWT features power of more than 120 watts, a power gain of 43 decibels (decibel being a unit for measuring relative loudness sound) and total efficiency exceeding 45 percent strict requirements of broadcast satellites. B.W.

N85-19311# Joint Publications Research Service, Arlington, Va.
NTT (NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORPORATION) DEVELOPS NEW OPTICAL FIBER c74
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-002) 24 Jan. 1985 p 9 Repr. from Kyodo (Tokyo), no. 0758 GMT, 7 Nov. 1984 (For primary document see N85-19309 10-32)
Avail: NTIS HC A04/MF A01

The development of a new optical fiber five times as powerful in transmission capacity as conventional products is discussed. With the help of a high-density germanium additive as a power booster, the new product is claimed able to transmit optical signals over a 100-kilometer distance without relay equipment. Conventionally, the optical fiber transmission line is relayed every 20 kilometers with a special device to boost the capacity diminishing in proportion to distances from the light source. B.W.

N85-19312# Joint Publications Research Service, Arlington, Va.
CHINA'S FUTURE DOMESTIC SATELLITE COMMUNICATIONS SYSTEMS
Guo Liang and Yu Yaokun *In its* Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-002) 24 Jan. 1985 p 11-14 Transl. into ENGLISH from Dianxin Jishu (Peking), no. 1, 1984 p 15-16 (For primary document see N85-19309 10-32)
Avail: NTIS HC A04/MF A01

Some ideas about China's future domestic satellite communications system are discussed. The following objectives are considered in the design of the new domestic satellite communications system: (1) the satellite communications system should link the entire country and form a unified national network with the existing ground communications system, (2) based on the geographic situation, the satellite communications system should be primarily small and scattered in the west, and large and concentrated in the east, (3) the Telephone business should be the primary business of the satellite communications system. It should also be capable of transmitting television, telegram, data, facsimile, and broadcasting, (4) the communications system should be primarily designed as a single jump system. It should not exceed two jumps, and (5) the parameters of the communications system should be in agreement with CCIR and CCITT recommendations. B.W.

N85-19313# Joint Publications Research Service, Arlington, Va.
CHINA'S DOMESTIC SATELLITE COMMUNICATIONS
Zhang Mingde and Wu Shoukang *In its* Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-002) 24 Jan. 1985 p 15-18 Transl. into ENGLISH from Dianxin Jishu (Peking), no. 1, 1984 p 117-118 (For primary document see N85-19309 10-32)
Avail: NTIS HC A04/MF A01

The history of satellite use for domestic communications in China is discussed. Near term applications of satellite communications in China are addressed. Various aspects of satellite transmission, including ground stations are covered. B.W.

N85-19314# Joint Publications Research Service, Arlington, Va.
WORLDWIDE REPORT: TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT
26 Feb. 1985 64 p Transl. into ENGLISH from various worldwide articles
(JPRS-TTP-85-006) Avail: NTIS HC A04/MF A01

The development and utilization of various communications technologies in individual countries in Asia, sub-Saharan Africa, Latin America, Europe, and the Near-East are reported. Specifications for Brasilsat are included along with examples of international cooperation for technology transfer. For individual titles, see N85-19315 through N85-19321.

N85-19315# Joint Publications Research Service, Arlington, Va.
NTT UNVEILS SATELLITE COMMUNICATIONS EQUIPMENT Abstract Only
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 1 Repr. from Kyodo (Tokyo), 1 Feb. 1985 p 1222 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

A prototype of communications equipmnet to be mounted in the Nippon Telegraph and Telephone Public Corp's next generation communications satellite CS 3 was unveiled. The equipment, expected to serve as the core of the satellite, has its transponders, mainly of 20-30 gigahertz, arranged in a circular format. The first CS 3 will be launched in February 1988 and its improved antenna should widen communication coverage to include Okinawa. Author

N85-19316# Joint Publications Research Service, Arlington, Va.
EX-MINISTER URGES COMMUNICATIONS SATELLITE DEVELOPMENT
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 13-14 Transl. into ENGLISH from Naeo Na (Bangkok), 9 Sep. 1984 p 15 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

If Thailand wants to have its own satellite, it must establish a special unit because the country's present telecommunications units lack the expertise and technology to carry on this work. Thailand uses the INTELSAT satellite of the International Telecommunications Union and the Palapa satellite of Indonesia. Thailand would be affected if these two satellites experienced problems. Costs of building and operating communication satellites are considered. A.R.H.

N85-19317# Joint Publications Research Service, Arlington, Va.
COMMUNICATIONS SATELLITE NEEDS EXAMINED
Supharat *In its* Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 15-18 Transl. into ENGLISH from Siam Rat (Bangkok), 26 Sep. 1984 p 3 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

Thailand can use a communications satellite to provide various forms of international and domestic telecommunications services such as telephone, teleprinter, telephotograph, television and radio service. This can be done in a manner that is just as efficient as using a microwave radio and underwater and optical fiber cable system. A communications satellite is also superior in terms of flexibility and speed in putting it into operation with no restrictions on distance, routes or geographical characteristics. A ground radio transmitter-receiver station can be built anywhere radio waves from the satellite can be picked up. Costs of launching a satellite into orbit and procedures involved from a regulatory point of view are examined. Initiatives taken to provide Thailand with its own satellites are highlighted. A.R.H.

N85-19318# Joint Publications Research Service, Arlington, Va.
SATELLITE-COMPUTER INTERFACE Abstract Only
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 19 Transl. into ENGLISH from Thai Rat (Bangkok), 12 Nov. 1984 p 3 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

Data received in Thailand from satellites are to be put on disk for use with small computers in order to meet the needs of the private sector. Producing computer disks of data from satellites should result in data from satellites being used more widely. Private companies can read and analyze the data stored on the disks. At present, when private companies need data from satellites, besides having to buy satellite photographs from the Research Council, they must also use the computers of the Research Council or hire units that have computers to run the analysis for them.Author

N85-19319# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON START OF SCIENTIFIC DATA TRANSMISSIONS WITH USSR
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 20-28 Transl. into ENGLISH from Informatik (East Berlin), v. 31, no. 5, 1984 p 1-5; 14 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

Initiatives for the initiation of long-range data transmission in

the GDR are reported as well as the advantages of the state automated system for scientific and technical information (SASWTI). Access to data banks of the International Center for Scientific and Technical Information which contains R&D results from the USSR and other CEMA countries requires standardization of computer programs and compatibility of bibliographic document description. Procedures were created for establishing an integrated standardized retrospective data base. The introduction of network technology is faced with a series of difficulties and unsolved problems. The information network of the USSR Academy of Sciences is making a major contribution to the development of the SASWTI by providing the user with information in the data bases of the individual research centers. A number of funding and legal questions must be settled. A.R.H.

N85-19320# Joint Publications Research Service, Arlington, Va.
MATRA HAS EUROPE'S LARGEST WHITE ROOM FOR SATELLITES **c14**
Alain Perez *In its* Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 52-53 Transl. into ENGLISH from Ind. et Tech. (Paris), 10 Nov. 1984 p 39 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

A 2,150-sq m white room was constructed in Toulouse for the simultaneous integration of five satellites. The Telecom 1A and ECS 2 satellites were integrated there before their launch by Ariane last summer. Currently ECS 3, Telecom 1B, and SPOT 1 are in the facility, as well as the ECS 4, the SPOT 2, and the Telecom 1C platforms. Although a measure of profitability is being achieved, the clean room is under utilized. Competition from U.S. companies that produce communications satellites is strong. A.R.H.

N85-19321# Joint Publications Research Service, Arlington, Va.
CNES, INRA DO JOINT REMOTE-SENSING RESEARCH **c43**
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 54-55 Transl. into ENGLISH from Electron. Actualites (Paris), 16 Nov. 1984 p 21 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

One year before the launching of the French remote-sensing satellite Spot 1, the authorities and organizations concerned are actively preparing to take full advantage of the data it will supply to benefit agriculture. To that end, the Ministry of Agriculture created a Commission on Remote-Sensing which acts as a coordinator for the various departments of the ministry and the teaching and research institutions it supervises. Activities of the Commission are reported. A.R.H.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-19322 British Broadcasting Corp., London (England). Engineering Div.
A REFLECTOMETER UNIT FOR A 500 kW HF BALANCED SCREENED FEEDER
R. D. C. Thoday Nov. 1984 14 p ref
(BBC-RD-1984/13) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

A test reflectometer was produced for use on 500 kW high frequency (H.F.) senders in conjunction with a commercially-produced 750 kW soda load. The unit was designed for monitoring purposes and calibrated so that known matched and mismatched load conditions can be applied to a sender under test. Author

N85-19323*# Radiometrics, Inc., Huntsville, Ala.
EVALUATION OF MINIATURE VACUUM ULTRAVIOLET LAMPS FOR STABILITY AND OPERATING CHARACTERISTICS, LYMAN-ALPHA TASK Final Report
W. A. Hurd 22 Jan. 1985 20 p
(Contract NAS8-35812)
(NASA-CR-171345; NAS 1.26:171345) Avail: NTIS HC A02/MF A01 CSCL 09A

Modifications required to change the near ultraviolet source in the Optical Contamination Monitor to a source with output at or near the Lyman-Alpha hydrogen line are discussed. The effort consisted of selecting, acquiring and testing candidate miniature ultraviolet lamps with significant output in or near 121.6 nm. The effort also included selection of a miniature dc high-voltage power supply capable of operating the lamp. The power supply was required to operate from available primary power supplied by the Optical Effect Module (DEM) and it should be flight qualified or have the ability to be qualified by the user. B.W.

N85-19324*# Underwriters Labs., Inc., Northbrook, Ill.
SAFETY REQUIREMENTS FOR WIRING SYSTEMS AND CONNECTORS FOR PHOTOVOLTAIC SYSTEMS Final Report
Thomas Lundtveit Sep. 1984 87 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-955392)
(NASA-CR-174431; DOE/JPL-955392/3; NAS 1.26:174431) Avail: NTIS HC A05/MF A01 CSCL 09A

Safety requirements for roof-mounted photovoltaic (PV) arrays were established by considering the environmental use-conditions applicable to PV arrays and the differences between integral-, direct-, standoff- and rack-mounted modules. Those articles in the National Electrical Code (NEC) covering wiring systems are discussed to: (1) define the wiring systems; (2) identify the permitted uses and use-restrictions; (3) outline the advantages and disadvantages; and (4) address the concerns regarding support, protection against mechanical damage, and wet versus dry locations. The advantages and disadvantages of each wiring system are assessed to arrive at candidate wiring systems that are best suited for use in PV arrays. For candidate wiring systems having prohibitive use-restrictions issues are considered that need to be addressed by any proposed revision to the National Electrical Code to permit acceptance by the inspection authorities. Various wiring termination methods permitted by the NEC are discussed and those which have features that are desirable for PV applications are identified. Performance and construction requirements for PV cable and for PV connectors are presented in separate outlines of proposed investigations of these products. A.R.H.

N85-19325*# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
FEASIBLITY STUDY FOR A 34 GHz (Ka BAND) GYROAMPLIFIER Final Report
D. S. Stone, R. E. Bier, M. Caplan, H. E. Huey, D. R. Pirkle, J. D. Robinson, and L. Thompson Sep. 1984 160 p refs Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-956813)
(NASA-CR-174439; JPL-9950-961; NAS 1.26:174439) Avail: NTIS HC A08/MF A01 CSCL 09A

The feasibility of using a gyroklystron power tube as the final amplifier in a 400 kW CW 34 GHz transmitter on the Goldstone Antenna is investigated. A conceptual design of the gyroklystron and the transmission line connecting it with the antenna feed horn is presented. The performance characteristics of the tube and transmission line are compared to the transmitter requirements for a deep space radar system. Areas of technical risk for a follow-on hardware development program for the gyroklystron amplifier and overmoded transmission line components are discussed. B.W.

N85-19326*# Goodyear Aerospace Corp., Litchfield Park, Ariz.
INTERLEAVED ARRAY ANTENNA TECHNOLOGY DEVELOPMENT
30 Jan. 1985 55 p refs

(Contract NAS9-16430)
(NASA-CR-171845; NAS 1.26:171845; GERA-2702) Avail: NTIS HC A04/MF A01 CSCL 09C

This is the third phase of a program to establish an antenna concept for shuttle and free flying spacecraft earth resources experiments using Synthetic Aperture Radar. The feasibility of a plated graphite epoxy waveguide for a space antenna was evaluated. A quantity of flat panels and waveguides were developed, procured, and tested for electrical and mechanical properties. In addition, processes for the assembly of a unique waveguide array were investigated. Finally, trades between various configurations that would allow elevation (range) electronic scanning and that would minimize feed complexity for various RF bandwidths were made. B.W.

N85-19327*# Rockwell International Corp., Anaheim, Calif. Strategic Defence and Electro-Optical Systems Div.
SHUTTLE S-BAND HIGH GAIN SWITCHED BEAM BREADBOARD ANTENNAS Final Report
J. J. Mullaney 18 Jan. 1985 124 p
(Contract NAS9-17006)
(NASA-CR-171852; NAS 1.26:171852; C85-149/101; DRD-MA-183TF) Avail: NTIS HC A06/MF A01 CSCL 09C

The final fabrication and assembly of the S-band five-element, eight-beam breadboard antennas developed for the Space Shuttle program are described. Data summary sheets from component and final assembly testing are presented. A.R.H.

N85-19328*# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
DESIGN OF LOW LOSS HELIX CIRCUITS FOR INTERFERENCE FITTED AND BRAZED CIRCUITS Final Report
A. Jacquez Jan. 1983 113 p refs
(Contracts NAS3-21509; NAS3-22441)
(NASA-CR-168313; NAS 1.26:168313) Avail: NTIS HC A06/MF A01 CSCL 09C

The RF loss properties and thermal capability of brazed helix circuits and interference fitted circuits were evaluated. The objective was to produce design circuits with minimum RF loss and maximum heat transfer. These circuits were to be designed to operate at 10 kV and at 20 GHz using a gamma a approximately equal to 1.0. This represents a circuit diameter of only 0.75 millimeters. The fabrication of this size circuit and the 0.48 millimeter high support rods required considerable refinements in the assembly techniques and fixtures used on lower frequency circuits. The transition from the helices to the waveguide was designed and the circuits were matched from 20 to 40 GHz since the helix design is a broad band circuit and at a gamma a of 1.0 will operate over this band. The loss measurement was a transmission measurement and therefore had two such transitions. This resulting double-ended match required tuning elements to achieve the broad band match and external E-H tuners at each end to optimize the match for each frequency where the loss measurement was made. The test method used was a substitution method where the test fixture was replaced by a calibrated attenuator. B.W.

N85-19329# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF SYNTHESIS METHOD IN THE DESIGN OF GYROTRON ELECTRON GUNS
J. J. Barroso, A. S. Montes, and C. A. B. Silva Oct. 1984 37 p refs Submitted for publication
(INPE-3305-PRE/616) Avail: NTIS HC A03/MF A01

A synthesis method is used in the design of the electron gun for a 35 GHz gyrotron to be built at the Institute for Space Research (INPE). The synthesized equipotentials are obtained integrating a system of equations, whose boundary conditions are defined by the analytically extended self-consistent equations described the laminar flow. For laminar beams, with noninteresting electron paths, space charge effects cancel out and when compared to beams with intersecting trajectories, the velocity spread is greatly reduced. A systematic procedure for the design of axisymmetric electro-optical systems is presented, which allows the derivation of the synthesis parameters from the required characteristics of the electron gun. The synthesized gun is able to deliver a 215 kW electron beam with a calculated velocity spread of approx. 1%. Author

N85-19330*# National Aeronautics and Space Administration, Washington, D. C.
POSITIVE ELECTRODES OF NICKEL-CADMIUM BATTERIES
D. W. Wabner, L. Kandler, and W. Krienke Feb. 1985 22 p refs Transl. into ENGLISH from Metalloberflaeche (West Germany), v. 26, no. 2, 1982 p 68-74 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original document prepared by Inst. of Physical Chemistry and Electrochemistry, Technische Univ., Munich
(Contract NASw-4005)
(NASA-TM-77808; NAS 1.15:77808) Avail: NTIS HC A02/MF A01 CSCL 10C

Ni hydroxide sintered electrodes which are filled electrochemically are superior to chemically treated electrodes. In the electrochemical process, the hydroxide grows on the Ni grains and possesses a well-defined porous structure. Diffusion and conducting mechanisms are therefore facilitated. Author

N85-19331# Wisconsin Univ., Madison. Dept. of Electrical and Computer Engineering.
VARIABLE SPEED GENERATOR TECHNOLOGY OPTIONS FOR WIND TURBINE GENERATORS
T. A. Lipo Jun. 1984 8 p refs Sponsored by Wisconsin Electric Machines and Power Electronics Consortium
(RR-84-4) Avail: NTIS HC A02/MF A01

The electrical system options for variable speed operation of a wind turbine generator were considered. Systems considered for large wind turbine generators were: (1) dc generator with line commutated inverted bridge; (2) synchronous generator with thyristor rectifier and inverter; (3) doubly fed induction generator with dc current link rectifier and inverter; (4) doubly fed induction generator with dc voltage link rectifier and inverter; and (5) doubly fed induction generator and cycloconverter. Those systems considered for smaller wind turbine generators were: (1) dc generator with copper based dc voltage link; (2) induction generator with dc voltage link; (3) induction generator with cycloconverter; (4) induction generator with high frequency link converter; and (5) permanent magnet generator configuration. The key operating characteristics of each system are discussed and the major advantages and disadvantages of each are identified. G.L.C.

N85-19332# Naval Research Lab., Washington, D. C. Radiation-Matter Interactions Branch.
FLASHOVER FAILURES FROM WET-WIRE ARCING AND TRACKING Annual Report, Oct. 1983 - Sep. 1984
F. J. Campbell 17 Dec. 1984 24 p
(AD-A149055; NRL-MR-5508) Avail: NTIS HC A02/MF A01 CSCL 09/3

Flashover failure occurs in a wire bundle as a high-energy surge between a bare conductor delivering power and a ground-plane (e.g., metal framework or wire shielding) as the conductive path across adjacent wires approaches zero resistance. It happens as a violent blazing flashover in which the copper of the bare wire melts and splatters - causing melting and burn-through of some of the adjacent wires in the bundle. Thus, it could produce the loss of a number of circuits at once. Under service stress conditions the process leading to a flashover could begin as the wire insulation initially deteriorates by cracking or chaffing and the surfaces of adjacent wires in the bundles become contaminated due to salt spray, mist, fog and high humidity. Under these conditions, typical of Naval aircraft service, arcing and tracking initiate and eventually localized spots extend into a continuous carbonaceous path, bridging the wires from the fault to ground. At some point the wetting is no longer necessary to sustain the current, and the flashover strikes. This phenomena is known to develop on the surfaces of polymeric materials that readily carbonize when pyrolized and the susceptibility to fail by this mechanism is characterized in standard arcing and tracking tests.

The phenyl-containing polymeric materials fall into this class. Laboratory tests have demonstrated that flashover will occur on wires insulated with a hi-phenyl polyimide composite and also on wires insulated with a polyphenyl ketone polymer; whereas, two types of a polytetrafluoroethylene insulation did not carbonize or flashover in the test. These results are in agreement with other references on arcing and tracking studies. GRA

N85-19333# Department of the Army, Washington, D. C.
IMAGE LINE VOLTAGE CONTROLLED OSCILLATOR WITH REPLACEABLE COMPONENTS Patent Application
R. E. Horn, inventor (to Army) Filed 27 Dec. 1984 17 p
(AD-D011436; US-Patent-Appl-SN-679971) Avail: NTIS HC A02/MF A01 CSCL 09/5

A millimeter wavelength oscillator combining a mechanically tunable solid state diode element provides a basic stable steady wave energy source with fine-tuning capabilities not possible with a resonating cavity oscillator alone, and with an apparatus structure which is light in weight, compact, mechanically sturdy, and with easily accessible and quickly replaceable component parts. Author (GRA)

N85-19334# Department of the Army, Washington, D. C.
A COAXIAL CAVITY GUNN OSCILLATOR USING PROBE COUPLED MICROSTRIP Patent Application
R. E. Horn, inventor (to Army) Filed 27 Dec. 1984 20 p
(AD-D011437; US-Patent-Appl-SN-679972) Avail: NTIS HC A02/MF A01 CSCL 09/1

A millimeter wave microstrip transmission line is coupled to a solid state mechanically tunable cylindrical resonating coaxial cavity millimeter-wave oscillator by means of a probe extending linearly from the microstrip through an access slot in the cylindrical cavity wall into the zone of optimum electric field strength in the oscillator cavity to effect the translation of a TEM wave from the resonating cavity to the microstrip line at optimum power transfer and without wave mode change. Author (GRA)

N85-19335# Department of the Army, Washington, D. C.
AN INTEGRATED VARACTOR TUNED COAXIAL GUNN OSCILLATOR FOR 60 GHz OPERATION Patent Application
J. W. Boyle, inventor (to Army) Filed 27 Dec. 1984 15 p
(AD-D011439; US-Patent-Appl-SN-679974) Avail: NTIS HC A02/MF A01 CSCL 09/5

In general, the invention according to our concept comprehends a millimeter wave oscillator which comprises, in combination, a housing or base portion which is provided with a resonating cavity, a solid state mechanically tuneable element which is adjustably moveably disposed in the housing, conveniently by means of a threaded engagement in a brass collar or the like fitting secured to the housing, which tuneable element is capable of producing millimeter-wave energy output at a frequency corresponding to its position in the resonate cavity, and a solid state electronically tuneable element arranged and physically disposed concentrically with same. Position adjustment means are provided exterior of the housing and operably connect to the mechanically tuneable element. Mechanical means connect between the mechanically tuneable element and the exteriorly located position adjustment means, and an electrical bias source is provided for each of the tuneable elements. GRA

N85-19336# Department of the Army, Washington, D. C.
FILTER REFLECTION IMAGE GUIDE OSCILLATOR AND SOLID STATE LINE SCANNING DEVICE Patent Application
H. Jacobs, inventor (to Army) Filed 13 Sep. 1984 30 p
(AD-D011440; US-Patent-Appl-SN-679970) Avail: NTIS HC A03/MF A01 CSCL 09/1

This document describes a filter reflection image guide oscillator and a solid state line scanning device. The device includes a brass metal heat sink base on which a dielectric waveguide is mounted. A resonant cavity is defined in the dielectric waveguide and an oscillator diode, Gunn or IMPATT, for example, is located in the resonant cavity. The resonant cavity is enclosed by a metal cover with a post which is made to extend into the resonant cavity to contact one electrode of the oscillator diode. The top surface of the waveguide includes a perturbation surface consisting of parallel and spaced metal stripes which are laterally positioned along the length of the waveguide. The spacing of the metal stripes defines the function performed by the device. By changing the bias voltage of the oscillator diode or with the addition of a varactor with a separate DC bias source, the frequency in the waveguide can be changed and thus line scanning or beam steering is made possible. GRA

N85-19337# Department of the Air Force, Washington, D.C.
IMPROVED MAGNETIC BIAS AND DELAY LINEARITY IN A MAGNETOSTATIC WAVE DELAY LINE Patent Application
K. K. Jin, inventor (to Air Force) Filed 24 Oct. 1984 33 p
(AD-D011441; US-Patent-Appl-SN-664193) Avail: NTIS HC A03/MF A01 CSCL 09/1

A cascade combination of magnetostatic delay line elements operating in different signal propagation modes for the purpose of achieving dispersion cancellation: magnetic bias control of the attained frequency-dependent delay and a magnetic bias field establishing apparatus for providing the tubular, laminar magnetic flux needed for backward volume wave operation of a magnetostatic delay element are also included. Author (GRA)

N85-19338# Missouri Univ., Rolla.
RELIABILITY STUDIES OF CERAMIC CAPACITORS Progress Report, 1 Jul. 1983 - 1 Oct. 1984
W. Huebner, H. U. Anderson, and D. E. Day Oct. 1984 251 p
(Contract N00014-82-K-0294)
(AD-A149126) Avail: NTIS HC A12/MF A01 CSCL 09/1

The major objective of our research program is to determine the mechanisms which induce intrinsic and extrinsic failure of ceramic capacitors. Towards this end we are making extensive electrical measurements and microstructural evaluations on both commercial and laboratory-prepared specimens. The measurements being performed include: (1) current as a function of time, temperature, and applied field to evaluate both low and high voltage degradation, (2) destructive microstructural evaluations, (3) thermally stimulated polarization/depolarization current (TSPC/DC) measurements. This combination of experiments has provided us with a great deal of information concerning degradation phenomena. The report is divided into three sections: (1) Low voltage degradation, (2) High voltage degradation, and (3) TSPC/DC measurements. GRA

N85-19339# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
RESEARCH INTO SELF-TIMED VLSI CIRCUITS Semiannual Report
R. J. Lipton 22 Oct. 1984 61 p
(Contract N00014-82-K-0549)
(AD-A149140) Avail: NTIS HC A04/MF A01 CSCL 09/5

ALLENDE is a simple and powerful layout language, associated with a structured design methodology for VLSI. It has a combination of features that set it apart from the existing VLSI layout tools. These features include the procedural language approach, the structured specification of the layout, the use of constraints to represent the layout, and the use of an intermediate form in the implementation of the system. In ALLENDE the layout is described hierarchically as a composition of cells; absolute sizes or positions are never specified. The layout description is translated into linear constraints, which express design rules and relative position of the layout elements. By solving these constraints we obtain the absolute layout, which is guaranteed to be free of design rule violations. Errors in the layout description are immediately detected and easily located. ALLENDE consists of five procedures to be called from a Pascal or C program, allowing the user to describe a VLSI layout. A lot of parameterization is possible when specifying layout elements, besides the ability to make use of the full power of Pascal or C. The ALLENDE layout system has been implemented for the MOS technology. In this system we can also use cells generated by other layout tools. Our layout language can also be a target for a silicon compiler. GRA

N85-19340# Mission Research Corp., Albuquerque, N. Mex.
IMPROVED ELECTRON EMISSION BY USE OF A CLOTH FIBER CATHODE
R. J. Adler, G. F. Kiuttu, B. E. Simpkins, D. J. Sullivan, and D. E. Voss Oct. 1984 9 p
(Contracts F49620-82-C-0014; F29601-84-C-0019)
(AD-A149250; AMRC-N-275) Avail: NTIS HC A02/MF A01 CSCL 09/1

Intense electron beams are usually produced by applying a strong electric field (> 400 kV/cm) to the surface of a suitable material. In a number of applications of intense, pulsed beams, such as Free Electron Lasers, microwave generation and collective ion acceleration, good uniformity is desirable. In addition, there are many applications such as laser pumping and microwave generation where it is useful to produce pulsed electron beams at relatively low potentials (20-50 kV) and high currents (.2-10 kA). This document presents data which demonstrates that cloth fiber cathodes can have superior properties as cold cathode emitters. The specific material used is a 12/cm x 12/cm array of tufts, each composed of approximately 40, 75% rayon, 25% silk, 10-20 micron diameter, 1 mm long fibers. Each fiber is oriented approximately perpendicular to the cloth substrate. The substrate is, in turn, attached to a stainless steel base using a thin layer of epoxy. This material is easily obtained at any cloth store at a nominal cost. GRA

N85-19341# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
QUALITATIVE OF ANALYSIS OF MOS CIRCUITS
B. C. Williams Jul. 1984 93 p
(Contracts N00014-80-C-0505; N00014-80-C-0622)
(AD-A149267; AI-TR-767) Avail: NTIS HC A05/MF A01 CSCL 09/5

With the push towards sub-micron technology, transistor models have become increasingly complex. The number of components in integrated circuits has forced designers' efforts and skills towards higher levels of design. This has created a gap between design expertise and the performance demands increasingly imposed by the technology. To alleviate this problem, software tools must be developed that provide the designer with expert advice on circuit performance and design. This requires a theory that links the intuitions of an expert circuit analyst with the corresponding principles of formal theory (i.e., algebra, calculus, feedback analysis, network theory, and electrodynamics), and that makes each underlying assumption explicit. Temporal Qualitative Analysis is a technique for analyzing the qualitative large signal behavior of MOS circuits that straddle the line between the digital and analog domains. Temporal Qualitative Analysis is based on the following four components: First, a qualitative representation is composed of a set of open regions separated by boundaries. These boundaries are chosen at the appropriate level of detail for the analysis. This concept is used in modeling time, space, circuit state variables, and device operating regions. Second, constraints between circuit state variables are established by circuit theory. At a finer time scale, the designer's intuition of electrodynamics is used to impose a casual relationship among these constraints. Third, large signal behavior is modeled by Transition Analysis, using continuity and theorems of calculus to determine how quantities pass between regions over time. GRA

N85-19342# Mission Research Corp., Albuquerque, N. Mex.
VIRTUAL CATHODE OSCILLATOR STUDY Annual Report
D. J. Sullivan, D. E. Voss, R. J. Adler, W. M. Bollen, R. H. Jackson, and E. A. Coutsias Nov. 1984 116 p
(Contract F49620-82-C-0014)
(AD-A149268; AMRC-R-614; AFOSR-84-1173TR) Avail: NTIS HC A06/MF A01 CSCL 09/1

The main thrust of research in the second year of this program has been experimental. This report summarizes the progress made in developing the hardware for a millimeter wavelength virtual cathode microwave oscillator (Vircator). Fabrication, testing, and calibration of two critical components, the solenoidal magnet and the millimeter microwave spectrometer, is complete. Data summary and complete documentation of the testing of the magnetic field coil at the 30 kG level, is presented in Section 2. Calibration data for the spectrometer, covering the entire 35 to 100 GHz frequency range, is presented in Section 3. Section 4 describes the successful operation of the electron beam pulse power system, based on an artificial Blumlein design. A unique cathode material is described which allows fast turn of electron field emission, at field strengths of approximately 50 kV/cm and very slow anode-cathode gap closure rates, less than 1 cm/Microsecs. GRA

N85-19343# Martin Marietta Corp., Denver, Colo.
ADVANCED INVERTER TECHNOLOGY Interim Report, Oct. 1982 - Oct. 1983
R. L. Moser Wright-Patterson AFB, Ohio AFWAL Jul. 1984 79 p
(Contract F33615-82-C-2239)
(AD-A149335; MCR-83-644; AFWAL-TR-84-2047) Avail: NTIS HC A05/MF A01 CSCL 10/2

APL has three existing series resonant inverter-based power converters: Power--10kW, 5kW, 200kW, Topology--dc/dc 1/2 Bridge, ac/dc Full Bridge, dc/dc Dual Full Bridge, the control and protection circuits are different for the three units. The purpose of this program was to produce a control and protection architecture and functional circuits that would work with all three power stage topologies. The requirements for the three existing power stages were determined. The three existing control and protection circuits were analyzed. An IC technology study was performed to determine the optimum technology and fabrication method for SRI control and protection circuits. A control and protection architecture utilizing common functional circuits that would work with the three existing topologies was developed and block diagrams drawn. The functional tasks were portitioned into five custom parts. The requirements for the custom parts were described. A study was performed to assess the potential present and future functions for a microprocessor in a series resonant inverter. Packaging and thermal study was performed to investigate the problems associated with space deployment of a 200-kW series resonant inverter. Recommendations for control and protection architecture, functional circuits, parts selection, and fabrication as hybrid circuits are made. GRA

N85-19344# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
GaAlAs Sb APD OPTIMIZATION Final Technical Report, May 1982 - Aug. 1983
R. Chin Oct. 1984 52 p
(Contract F19628-82-C-0005)
(AD-A149406; MRD41113.4FR; RADC-TR-84-191) Avail: NTIS HC A04/MF A01 CSCL 19/1

It has been demonstrated that avalanche gain can be obtained in GaAlSb avalanche photodiodes which exhibit ionization coefficient enhancement. These devices exhibit gain at relatively high impurity background density of 8-9 x 10 to the 15th power/cu cm. This indicates that a tunneling process which occurs in these devices is associated with a deep level rather than a band-to-band process. Surface leakage current, which dominates the total dark current of these avalanche photodiodes at room temperature, can be reduced with the use of special structures. However, as shown in this work through both modeling and experiment, defect assisted tunneling may be a fundamental limitation to obtaining high sensitivity devices. Finally, a serious problem from the manufacturing standpoint is the necessity to compensate the native defect that results in a high concentration of intrinsic p-type acceptor levels. Precise control of dopant incorporation is required to reproducibly obtain the required net impurity levels. This is an extremely difficult process with the available LPE GaAlSb materials technology. GRA

N85-19345# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
ELECTROMAGNETIC BRAKING OF A METALLIC PROJECTILE IN FLIGHT Technical Report, 1-31 Aug. 1983

J. Bennett, T. Gora, P. J. Kemmey, and W. J. Kolkert Dec. 1984 17 p
(AD-A149424; AD-E401271; ARLCD-TR-84022) Avail: NTIS HC A02/MF A01 CSCL 19/1

A sample model for the electromagnetic deceleration of a moving metallic projectile is described. This model incorporates the influence of magnetic field parameters, time-dependent field diffusion, and device geometry to approximate the braking action. The model predicts that a viable experimental braking device can be designed. GRA

N85-19346# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A CIRCUIT GRAMMAR FOR OPERATIONAL AMPLIFIER DESIGN Ph.D. Thesis
A. L. Ressler Jan. 1984 95 p
(Contract N00014-80-C-0622)
(AD-A149566; AI-TR-807) Avail: NTIS HC A05/MF A01 CSCL 09/2

Electrical circuit designers seldom create really new topologies or use old ones in a novel way. Most designs are known combinations of common configurations tailored for the particular problem at hand. In this thesis I show that much of the behavior of a designer engaged in such ordinary design can be modeled by a clearly defined computational mechanism executing a set of stylized rules. Each of my rules embodies a particular piece of the designer's knowledge. A circuit is represented as a hierarchy of abstract objects each of which is composed of other objects. The leaves of this tree represent the physical devices from which physical circuits are fabricated. By analogy with context-free languages, a class of circuits is generated by a phrase-structure grammar, of which each rule describes how one type of abstract object can be expanded into a combination of more concrete parts. Circuits are designed by first postulating an abstract object which meets the particular design requirements. This object is then expanded into a concrete circuit by successive refinement using rules of my grammar. There are in general many rules which can be used to expand a given abstract component. Analysis must be done at each level of the expansion to constrain the search to a reasonable set. GRA

N85-19347# Department of the Army, Washington, D. C.
METHOD OF HEATING QUARTZ RESONATORS Patent Application
J. A. Kosinski, inventor (to Army) Filed 14 Dec. 1984 9 p
(AD-D011454; US-Patent-Appl-SN-681733) Avail: NTIS HC A02/MF A01 CSCL 09/1

A quartz crystal resonator is heated by mounting and plating the resonator within an enclosure wherein the inner wall of the enclosure bears a reflective coating. Heating elements are positioned within the enclosure so as to be spaced from the resonator. The enclosure is then evacuated and sealed and a current caused to flow in the heating elements. Author (GRA)

N85-19348# Department of the Army, Washington, D. C.
DIGITAL HIGH SPEED PROGRAMMABLE CONVOLVER Patent Application
T. C. Rearick, inventor (to Army) Filed 17 Dec. 1984 12 p
(AD-D011455; US-Patent-Appl-SN-682126) Avail: NTIS HC A02/MF A01 CSCL 09/5

A circuit module for rapidly calculating a discrete numerical convolution is described. A convolution such as finding the sum of the products of a 16 bit constant and a 16 bit variable is performed by a module which is programmable so that the constant may be changed for a new problem. In addition, the module may be programmed to find the sum of the products of 4 and 8 bit constants and variables. RAM (Random Access Memories) are loaded with partial products of the selected constant and all possible variables. Then, when the actual variable is loaded, it acts as an address to find the correct partial product in the particular RAM. The partial products from all of the RAMs are shifted to the appropriate numerical power position (if necessary) and then added in adder elements. Author (GRA)

N85-19349# Department of the Navy, Washington, D. C.
CONNECTOR/NITINOL DELTA CONTACT FORCE DEVICE Patent Application
R. F. Kemka, inventor (to Navy) Filed 7 May 1984 10 p
(AD-D011467; US-Patent-Appl-SN-607477) Avail: NTIS HC A02/MF A01 CSCL 09/1

An electrical connector employs a pin and socket mechanism enclosed by a contact force device. The contact force device has a uniqueness so that after insertion of the pin in the socket with the device at a very low temperature is completed, the device is allowed to return to ambient temperature. The separation force of the pin and socket mechanism is much greater than the insertion force. The contact force device uses nitinol and takes advantage of its transformation temperature in shifting from austenite phase to martensite phase and vice-versa. GRA

N85-19350# Department of the Army, Washington, D. C.
LIGHTWEIGHT CLADDING FOR MAGNETIC CIRCUITS Patent Application
H. A. Leupold, inventor (to Army) Filed 24 Dec. 1984 21 p
(AD-D011469; US-Patent-Appl-SN-685426) Avail: NTIS HC A02/MF A01 CSCL 09/5

This invention relates generally to the field of magnetic circuits for electronic devices, and more specifically to a magnetic circuit including a structure for magnetically cladding the circuit to eliminate undesirable exterior magnetic fields. GRA

N85-19351# Department of the Army, Washington, D. C.
INTEGRATED CIRCUIT TUNABLE CAVITY OSCILLATOR Patent Application
H. Jacobs, inventor (to Army) 27 Dec. 1984 16 p
(AD-D011474; US-Patent-Appl-SN-679969) Avail: NTIS HC A02/MF A01 CSCL 09/5

An integrated circuit tunable cavity oscillator is described for extremely high frequency operation in image line waveguide. The oscillator includes a metal base with a cylindrical bore, a dielectric or semiconductor waveguide mounted atop the metal base and having a bore which is continuous with the metal base bore. A Gunn or IMPATT diode is assembled in the metal base bore on top of a drum which is urged upwards toward the waveguide bore by a spring located behind the drum. From above a top disk and a threaded screw cover the waveguide bore and push the diode into the metal base bore to define the cavity height of the coaxial cavity of the oscillator. The waveform, which is set up in the recessed cavity in the metal base, is launched into the waveguide. Thus, a ruggedized, low cost, tunable (by a tuning screw) and low weight oscillator for millimeter wave image line or microstrip operation is obtained. Furthermore, the oscillator diode and cavity defining hardware are easily replaceable. GRA

N85-19352# Department of the Air Force, Washington, D.C.
MECHANICAL LOCKING BETWEEN MULTI-LAYER PRINTED WIRING BOARD CONDUCTORS AND THROUGH-HOLE PLATING Patent Application
E. Taylor, inventor (to Air Force) Filed 2 Oct. 1984 22 p
(AD-D011477; US-Patent-Appl-SN-657097) Avail: NTIS HC A02/MF A01 CSCL 09/5

This invention relates to the field of electrical printed wiring board structure and to the manufacture of such boards. A plated through-hole conductor structure for a multiple layer laminate electronic printed wiring board includes mechanical locking of the plated through conductor with textured conductor surfaces together with use of etching or other processing to provide laminate internal space for the mechanical locking structure. A manufacturing sequence and plural material selections are also disclosed. GRA

N85-19353# Department of the Air Force, Washington, D.C.
HIGH VOLTAGE DISCONNECT PROTECTION Patent Application
D. Frank and E. Flemming, inventors (to Air Force) Filed 16 Nov. 1984 18 p
(AD-D011480; US-Patent-Appl-SN-672239) Avail: NTIS HC A02/MF A01 CSCL 09/5

The apparatus comprises a high voltage disconnect and load isolation switch. During normal operations commercial power is conducted through a pair of contacts a and b to a load. When a high voltage (HV) component is detected by an HV pulse detector, a command from the HV detector opens a secondary power interrupter while simultaneously activating the opening of contacts a and b. A surge protector conducts some of the HV energy greater than the source, or commercial power, to ground. As contacts a and b open, HV ground probes are positioned at a slight distance (dielectric constant equal to the commercial power source) from these contacts. These probes provide a ground source for an HV component throughout the complete transition of contact b to the rest position, which will be at ground potential. There is now full isolation from the source of power supply. GRA

N85-19354# Oak Ridge National Lab., Tenn.
EXPERIENCE HIGHLIGHTS FROM THE DESIGN AND MANUFACTURE OF US LCT COILS
R. K. Kibbe, C. M. Amonett, R. D. Benson, R. O. Hussung, and W. D. Shipley 1984 4 p refs Presented at the Applied Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE84-017504; CONF-840937-3) Avail: NTIS HC A02/MF A01

The international large coil task (LCT) is a major activity in the development of superconducting toroidal field (TF) coils for Tokamak fusion reactors. The technical objective of this program is to design, build, and test six large TF coils, to produce information and data that can be used directly by program planners and designers of Tokamak reactors. All six coils will be tested in a compact toroidal array in the large coil test facility (LCTF). The major technical challenges and lessons from the design and manufacture of the three US LCT coils are reviewed. DOE

N85-19355# General Electric Co., Schenectady, N. Y. Research and Development Center.
PERMANENT MAGNET MOTORS
E. Richter Sep. 1984 166 p refs
(Contract DE-AC05-84CR-21400)
(DE85-000660; ORNL/Sub-82-17452/1) Avail: NTIS HC A08/MF A01

The work deals with the design and analysis study for the conceptual design of an economical high efficiency ac motor based on permanent magnets. The design and trade off studies have covered the material considerations, the design tradeoff options as well as transient and steady state performance considerations, and other options. The baseline comparison is the high efficiency induction motor. The permanent magnet (PM) motor must fit into the same frame size and surpass the induction motor on a life cost basis that includes 2.5 years of operation at a 50% duty cycle. It is shown that a motor based upon ferrite magnets does meet the objectives of the program in ratings of up to 25 hp. A 7.5 motor design is carried through the conceptual design stage. DOE

N85-19356# Michigan Technological Univ., Houghton. Dept. of Electrical Engineering.
ANALYSIS OF INVERTER MODELS AND HARMONIC PROPAGATION. PART 2: HARMONIC PROPAGATION
M. A. Slonim and E. K. Stanek Sep. 1984 63 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000198; SAND-83-7040/2-Pt-2) Avail: NTIS HC A04/MF A01

The harmonic propagation is described in the photovoltaic power system consisting of the solar cell array, the inverter, and the ac side of the inverter up to the infinite bus of the utility. Two main problems are analyzed: power in the converter system and harmonics of the current and voltage waveforms of the single phase, dependent inverter. Relationships between the different components of the converter power - active, reactive and disturbance - are discussed. All formulas necessary for calculating the power components are given, assuming the harmonics of the current and voltage waveforms are known. The theoretical and experimental investigation of the single phase, dependent inverter is described. The ac and dc terminal voltage of the inverter are analyzed and their harmonics are obtained. These data determine the harmonic propagation on both the dc and ac sides and may be useful for equipment design. DOE

N85-19357# Sandia Labs., Albuquerque, N. Mex.
CENTRIFUGE TESTS TO PROVIDE CLOSURE BOUNDS FOR SWITCHES SUBJECTED TO RANDOM VIBRATION
Ronald Roderman and Thomas G. Priddy 1985 18 p ref Presented at the 3rd Intern. Modal Analysis Conf., Orlando, Fla., 28 Jan. 1985
(Contract DE-AC04-76DP-00789)
(DE85-002003; SAND-84-2092C; CONF-850228-3-Draft) Avail: NTIS HC A02/MF A01

A centrifuge test at a constant acceleration level that bounds from above the closure that would be experienced by a normally open switch subjected to a stationary random excitation of fixed duration is derived. The bound is probabilistic in that the induced displacement will be exceeded with a certain selectable probability. The bound was formulated in terms of the system modal properties. Because the spatial distribution of the excitation is smooth and the frequency content is wide band the response is dominated by the first few lowest modes of the structure. It is further shown that the bound is relatively insensitive to the selected desired reliability. Experiments which verify the validity of the bound have been performed. DOE

N85-19358# Maryland Univ., College Park.
MAGNETOSTATIC PROBLEMS IN NONLINEAR MEDIA WITH HYSTERESIS Progress Report
I. D. Mayergoyz 1984 4 p
(Contract DE-AS05-84ER-13145)
(DE85-003701; DOE/ER-13145/T1) Avail: NTIS HC A02/MF A01

Magnetostatic problems in nonlinear media with hysteresis was investigated. The following topics were studied: mathematical models for scalar hysteresis nonlinearities, boundary Galerkin's approach for the solution of exterior field problems, development and testing of a new quasifinite element discretization technique based on the boundary Galerkin approach, and investigation of new iterative methods for the solution of discrete Bellman equations and quasivariational inequalities. DOE

N85-19227*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECTS OF MODE IMPURITY OF Ka-BAND SYSTEM PERFORMANCE
D. J. Hoppe, W. A. Imbriale, and A. M. Bhanji *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 12-23 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 09A

N85-19278# Dutch Post Office, Dr. Neher Lab., Leidschendam.
THE IMPACT OF PROPAGATION EFFECTS ON THE DESIGN OF HIGH CAPACITY DIGITAL MICROWAVE LINKS IN THE 18 GHz FREQUENCY BAND
L. vanderHoek, A. Mawira, and J. Neesen *In* AGARD Propagation Influences on Digital Transmission Systems Oct. 1984 18 p refs (For primary document see N85-19269 10-32)
Avail: NTIS HC A22/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-19359 Minnesota Univ., Minneapolis.
EFFECT OF INCLINATION, TRANSVERSE INTERTIP SPACING,

AND LOGITUDINAL PITCH ON CROSSFLOW HEAT TRANSFER FROM AN ARRAY OF FINNED TUBES Ph.D. Thesis
Farzad Samie 1984 170 p
Avail: Univ. Microfilms Order No. DA8424739

Experiments were performed to investigate the heat transfer characteristics of a circumferentially finned, crossflow heat exchanger. Three aspects of the heat transfer were examined. The first was the effect of inclining a single tube at an angle of attack to the crossflow. The secoind dealt with the transverse intertip spacing S sub T in a single-row heat exchanger, while the third focused on the longitudinal intertip spacing S sub L and array pattern (in-line or staggered) in a double-row heat exchanger. For the entire investigations, the freestream Reynolds number ranged from 7,500 to 32,000. The Nusselt number for the single tube displayed a moderate increase with increasing inclination angle, about 20 percent for a 40 degree inclination. The single-row Nusselt number and pressure drop increased rapidly with decreasing S sub T at a fixed freestream Reynolds number but was less sensitive to S sub T at fixed minimum-area Reynolds number.
Dissert. Abstr.

N85-19360*# Software and Engineering Associates, Inc., Santa Ana Heights, Calif.
A SHOCK WAVE CAPABILITY FOR THE IMPROVED TWO-DIMENSIONAL KINETICS (TDK) COMPUTER PROGRAM Final Report
Gary R. Nickerson and Lanh D. Dang Mar. 1984 119 p
(Contract NAS8-34974)
(NASA-CR-171302; NAS 1.26:171302; SN-55) Avail: NTIS HC A06/MF A01 CSCL 20D

The Two Dimensional Kinetics (TDK) computer program is a primary tool in applying the JANNAF liquid rocket engine performance prediction procedures. The purpose of this contract has been to improve the TDK computer program so that it can be applied to rocket engine designs of advanced type. In particular, future orbit transfer vehicles (OTV) will require rocket engines that operate at high expansion ratio, i.e., in excess of 200:1. Because only a limited length is available in the space shuttle bay, it is possible that OTV nozzles will be designed with both relatively short length and high expansion ratio. In this case, a shock wave may be present in the flow. The TDK computer program was modified to include the simulation of shock waves in the supersonic nozzle flow field. The shocks induced by the wall contour can produce strong perturbations of the flow, affecting downstream conditions which need to be considered for thrust chamber performance calculations. B.W.

N85-19361*# Continuum, Inc., Huntsville, Ala.
PRELIMINARY ANALYSIS OF SELECTED GAS DYNAMIC PROBLEMS Final Report
Robert J. Prozan and Richard C. Farmer 21 Jan. 1985 15 p ref Original contains color illustrations
(Contract NAS8-35328)
(NASA-CR-171343; NAS 1.26:171343; CI-FR-0081) Avail: NTIS HC A02/MF A01 CSCL 20D

The VAST computer code was used to analyze SSME main combustion chamber start-up transients and the IUS flow field for a damaged nozzle was investigated to better understand the gas dynamic considerations involved in vehicle problems, the effect of start transients on the nozzle flow field for the SSME, and the possibility that a damaged nozzle could account for the acceleration anomaly noted on IUS burn. The results obtained were compared with a method of characteristics prediction. Pressure solutions from both codes were in very good agreement and the Mach number solution on the nozzle centerline deviates substantially for the high expansions for the SSME. Since this deviation was unexpected, the phenomenon is being further examined.
A.R.H.

N85-19362*# Continuum, Inc., Huntsville, Ala.
CALCULATION OF FLOW ABOUT POSTS AND POWERHEAD MODEL Interim Report
Peter G. Anderson and Richard C. Farmer 21 Jan. 1985 20 p
(Contract NAS8-35506)
(NASA-CR-171344; NAS 1.26:171344; CI-IR-0079) Avail: NTIS HC A02/MF A01 CSCL 20D

A three dimensional analysis of the non-uniform flow around the liquid oxygen (LOX) posts in the Space Shuttle Main Engine (SSME) powerhead was performed to determine possible factors contributing to the failure of the posts. Also performed was three dimensional numerical fluid flow analysis of the high pressure fuel turbopump (HPFTP) exhaust system, consisting of the turnaround duct (TAD), two-duct hot gas manifold (HGM), and the Version B transfer ducts. The analysis was conducted in the following manner: (1) modeling the flow around a single and small clusters (2 to 10) of posts; (2) modeling the velocity field in the cross plane; and (3) modeling the entire flow region with a three dimensional network type model. Shear stress functions which will permit viscous analysis without requiring excessive numbers of computational grid points were developed. These wall functions, laminar and turbulent, have been compared to standard Blasius solutions and are directly applicable to the cylinder in cross flow class of problems to which the LOX post problem belongs. G.L.C.

N85-19363*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL STUDY OF CERAMIC COATED TIP SEALS FOR TURBOJET ENGINES
T. J. Biesiadny, G. A. Klann (Army Research and Technology Labs., Cleveland), E. S. Lassow (Howmet Corp., Whitehall, Mich.), M. McHenry (Army Aviation Logistics School, Fort Eustis, Va.), G. McDonald, and R. C. Hendricks 1985 22 p refs Presented at the 9th Ann. Conf. on Composites and Advan. Ceram. Mater., Cocoa Beach, Fla., 20-24 Jan. 1985; sponsored by the American Ceramic Society
(NASA-TM-86939; E-2457; NAS 1.15:86939; USAAVSCOM-TM-84-C-2) Avail: NTIS HC A02/MF A01 CSCL 20D

Ceramic gas-path seals were fabricated and successfully operated over 1000 cycles from flight idle to maximum power in a small turboshaft engine. The seals were fabricated by plasma spraying zirconia over a NiCoCrAlX bond boat on the Haynes 25 substrate. Coolant-side substrate temperatures and related engine parameters were recorded. Post-test inspection revealed mudflat surface cracking with penetration to the ceramic bond-coat interface. Author

N85-19364*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RIBBON BURNER SIMULATION OF T-700 TURBINE SHROUD FOR CERAMIC LINED SEALS RESEARCH
J. K. Little (Arnold Air Force Station, Tullahoma, Tenn.), G. P. Allen, G. McDonald, and R. C. Hendricks 1985 20 p refs Presented at the 9th Ann. Conf. on Composites and Advan. Ceram. Mater., Cocoa Beach, Fla., 20-24 Jan. 1985; sponsored by the American Ceramic Society
(NASA-TM-86940; E-2458; NAS 1.15:86940) Avail: NTIS HC A02/MF A01 CSCL 20D

Experimental and analytical studies were conducted to determine the acceptability of a ribbon-burner simulation of engine conditions for testing ceramic-lined turbine tip shrouds. The calculated values reveal that the ribbon burner establishes at least as harsh a thermal environment as is present at any time within the turbine shroud. Comparisons were made with ceramic components in a turboshaft engine. Author

N85-19365*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A MULTISTAGE TIME-STEPPING SCHEME FOR THE NAVIER-STOKES EQUATIONS Final Report
R. C. Swanson and Eli Turkel Feb. 1985 37 p refs
(Contract NAS1-17070)
(NASA-CR-172527; ICASE-84-62; NAS 1.26:172527) Avail: NTIS HC A03/MF A01 CSCL 20D

A class of explicit multistage time-stepping schemes is used to construct an algorithm for solving the compressible Navier-

Stokes equations. Flexibility in treating arbitrary geometries is obtained with a finite-volume formulation. Numerical efficiency is achieved by employing techniques for accelerating convergence to steady state. Computer processing is enhanced through vectorization of the algorithm. The scheme is evaluated by solving laminar and turbulent flows over a flat plate and an NACA 0012 airfoil. Numerical results are compared with theoretical solutions or other numerical solutions and/or experimental data.
Author

N85-19366# Arizona Univ., Tucson. Engineering Experiment Station.
INTERNAL FORCED CONVECTION TO LOW PRANDTL NUMBER GAS MIXTURES Interim Report, 15 Jul. 1982 - 15 Jul. 1984
M. F. Taylor, K. E. Bauer, and D. M. McEligot 15 Jul. 1984 123 p
(Contract N00014-75-C-0694)
(AD-A148932; Rept-1248-10) Avail: NTIS HC A06/MF A01 CSCL 20/13

At a Prandtl number of about 0.2, the predictions of accepted correlations for heat transfer in fully established tube flow differ by a factor more than two. Since gas turbine systems proposed for propulsion use working fluids with the Prandtl number in this range it was necessary to resolve the discrepancy. By mixing helium with xenon or hydrogen with xenon, the range 0.16 < or approx. = Pr < or approx. = 0.7 can be obtained. Measurements with these mixtures in a vertical tube showed that the Colburn analogy and Dittus-Boelter substantially overpredict the Nusselt number for constant property conditions; best agreement was provided by relations suggested by Petukhov and by Kays. For moderated variation of gas properties (1 < T (sub w)/T (sub b) < or approx. = 2.2) the correlation for average friction factor by Taylor was verified; the exponent on the Prandtl number in his equation for heat transfer was modified to 0.65 in order to accommodate these new data. GRA

N85-19367# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C.
1984 AFOSR RESEARCH MEETING ON DIAGNOSTICS OF REACTING FLOW HELD AT NEW HAVEN, CONNECTICUT ON 21-22 MARCH 1984 Scientific Report, Mar. 1983 - Feb. 1984
L. H. Caveny Feb. 1984 62 p
(AD-A149023; AFOSR-TR-84-1113) Avail: NTIS HC A04/MF A01 CSCL 20/4

This document contains expanded abstracts from the 1984 meeting on the Air Force basic research program on diagnostics of reacting flow. The meeting (held at Yale University on 21-22 March, 1984) presented research directed at measuring temperatures, velocities, and concentrations in high performance combustion and plasma environments. GRA

N85-19368# Department of the Air Force, Washington, D.C.
VIBRATION ISOLATED COLD PLATE ASSEMBLY Patent Application
R. T. Dolbeare, inventor (to Air Force) Filed 31 Oct. 1984 12 p
(AD-D011444; US-Patent-Appl-SN-666786) Avail: NTIS HC A02/MF A01 CSCL 20/11

A vibration isolated cold plate assembly is described having a cold plate cover and a base interconnected together by means of a pair of elongated, rectangular-shaped elements made of elastomeric material. The elongated elements form there between a channel through which a coolant flows in communication with a plurality of cooling fins which are secured only to the undersurface of the cold plate cover. Electronic components are mounted on the upper surface of the cold plate cover and are held thereon in a vibration isolated environment while simultaneously having any excess heat dissipated therefrom. Author (GRA)

N85-19369# Pennsylvania State Univ., University Park. Applied Research Lab.
A FROZEN VORTICITY APPROACH TO THE AXISYMMETRIC STRONG INTERACTION PROBLEM
G. H. Hoffman 14 Sep. 1984 47 p
(Contract N00024-79-C-6043)
(AD-A149101; ARL/PSU/TM-84-146) Avail: NTIS HC A03/MF A01 CSCL 20/4

A highly automated numerical procedure is presented for calculating the flow field in the strong interaction region of a body of revolution. The method is based on the frozen vorticity approximation which allows the strong interaction flow field to be computed in three steps without iteration -a potential flow calculation, a boundary-layer calculation and a frozen vorticity calculation. The potential and frozen vorticity equations are solved by line relaxation with spline-finite difference discretization. Automation is achieved by a common streamwise grid spacing in all three calculations plus computer generated data files to transfer information to successive stages of the calculation. Numerical solutions are presented for two bodies and the results compared with published experimental data. GRA

N85-19370# California Inst. of Tech., Pasadena.
EFFECTS OF A PERIODIC DISTURBANCE ON STRUCTURE AND MIXING IN TURBULENT SHEAR LAYERS AND WAKES Ph.D. Thesis
F. A. Roberts 1985 225 p Original contains color illustrations
(Contract N00014-76-C-0260)
(AD-A149278) Avail: NTIS HC A10/MF A01 CSCL 20/4

Large scale structure and mixing processes are investigated in chemically reacting wakes and shear layers to which a periodic disturbance is applied. The experiments employ a diffusion-limited acid-base reaction to directly measure the extent of mixing. Optical diagnostics used include laser absorption and laser induced fluorescence. Absorption of laser light by reacted product provides a measure of cross-stream average product. Fluorescence was measured by a self-scanning linear photodiode array using high speed computer data acquisition to obtain the product distribution across the layer. Previous results showing that forcing alters the structure and growth rate of shear layers are confirmed. Forcing artificially extends the lifetime of vortices whose size is consistent with the disturbance wavelength. Amalgamation of smaller vortices is enhanced over that in the natural layer until the frequency locked scale is achieved. At high Reynolds numbers, on the other hand, there is an increase in product when forced. In one case a five fold increase in product was observed. The differences are related to the different effects of forcing on entrainment, composition ratio and secondary structure. GRA

N85-19371# Ballistic Research Labs., Aberdeen Proving Ground, Md.
AVERAGING EFFECTS IN MODELS OF THREE-DIMENSIONAL TWO-PHASE FLOWS
A. K. R. Celmins Oct. 1984 76 p
(AD-A149313; AD-F300500; BRL-TR-2598) Avail: NTIS HC A05/MF A01 CSCL 19/4

In order to avoid the treatment of individual particle motion in two-phase flow description, one can use volume averaged descriptors. However, if the averaging volume is too small then individual particles can cause large undulations of the averages. In this report the amplitude of such undulations is estimated by a bound. It is shown that in general, one must average over 30-150 particles in order to obtain reasonably smooth averages. A consequence for interior ballistics calculations is that volume averages may be used to model the core flow but in general they cannot be used to resolve radial structures in two phases. Also presented are examples of the representation of a gas-particle aggregate boundary in terms of the gas volume fraction, and an approximate expression is derived for the transition curve. GRA

N85-19372# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION OF LIQUID AND TWO-PHASE COOLING TECHNIQUES FOR USE IN ELECTRICAL MACHINERY Final Report, 1 Oct. 1983 - 30 Sep. 1984
A. S. Wanniarachchi and P. J. Marto Dec. 1984 56 p
(AD-A149528; NPS69-84-013) Avail: NTIS HC A04/MF A01

CSCL 09/3

The advantages that can be achieved through the use of advanced techniques for cooling of electric machinery are discussed. A brief literature survey is presented on liquid cooling of rotating machinery, where the liquid is in off-axis rotation. The lack of models to adequately predict pressure drop and heat-transfer performance in this situation has been noted. The use of heat-pipe cooling appears to be superior to liquid cooling techniques, which require rotating seals with questionable reliability. A detailed literature survey is presented to reveal the advancement achieved through the use of heat-pipe cooling of electric motors. Heat pipes have been successfully used to cool electric motors, resulting in lower and nearly uniform temperatures in rotors and stators. Heat-pipe cooling has been demonstrated to increase the power-to-weight ratio of electric motors by 50 percent or more. In addition, up to 10 percent increase in efficiency has been reported in the literature. GRA

N85-19373# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

VELOCITY MEASUREMENTS IN A 3D SHOCK WAVE LAMINAR BOUNDARY LAYER INTERACTION. PART 1: LOW SPEED 2D LDV MEASUREMENTS Interim Scientific Report, 1 Aug. 1983 - 31 Jul. 1984

G. Degrez and J. J. Ginoux 30 Sep. 1984 34 p

(Grant AF-AFOSR-0273-83)

(AD-A149533; VKI-CR-84-29; AFOSR-84-1225TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Single component LDV (Laser Doppler Velocimetry) measurements were obtained in the separated 2D thin laminar boundary layer over an elliptic cylinder. The ellipse had an axis ratio of 4:1 and the incoming Reynolds numbers based on the minor axis were 675 and 1350. Velocity measurements were obtained within 0.05 mm from the surface both in attached and reverse flow regions. Painting the model with matt black paint and covering the tunnel walls proved to be effective means of improving signal quality. Measurements were successful both in back and forward scatter modes. The velocity profiles measured with Bragg cells indicate that the flow is separated at the ellipse mid-chord and that the separation bubble extends far downstream in the wake. The velocity profiles in the attached flow region compare well with the results of a boundary layer computation. GRA

N85-19374# Stanford Univ., Calif. Joint Inst. of Aeronautics and Acoustics.

BASIC STUDIES OF MULTIPLE FREE AND CONFINED JETS Final Report, Jul. 1979 - Jun. 1984

A. Krothapalli, D. Baganoff, and K. Karamcheti 24 Aug. 1984 28 p

(Contract F49620-79-C-0189)

(AD-A149556; AFOSR-84-1176TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

An experimental investigation was carried out to study the mixing characteristics of a moderate aspect ratio rectangular free and confined jet; and free and confined multiple jet. The main parameters were the primary jet pressure ratio (stagnation pressure/ambient pressure) and the ejector mixing duct to width ratio. The pressure ratio varied from 1.5 to 5; the mixing duct to width ratio varied from 8 to 24, which is equivalent to the cross sectional area ratio from 11 to 34. It is found that an underexpanded jet inside a duct generates intense discrete tones (screech tones) similar to a free underexpanded jet. For a given pressure ratio, the variation of the dominant tone with duct widths shows staging behavior, and the frequency varies continuously with duct width in each stage. Similarly, for a given duct width, the variation of the dominant discrete frequency with pressure ratio shows staging behavior. It is found that enhanced mixing and improved performance of the ejector was related to the Strouhal number of the ejector screech tone. For all the duct widths tested, it is found that when the screech tone Strouhal number lies within the range 0.1 to 0.15, the primary jet spreading is increased and the ejector flow is better mixed at the exit. GRA

N85-19375# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

MIXING CHARACTERISTICS OF AN UNDEREXPANDED MULTIPLE JET EJECTOR Interim Report

M. S. Chandrasekhara, A. Krothapalli, and D. Baganoff Jun. 1984 51 p

(Contract F49620-79-C-0189)

(AD-A149557; SU-JIAA-TR-55; AFOSR-84-1195TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

A study of the mixing characteristics of an underexpanded multiple jet ejector is presented. Results obtained using schlieren flow visualization pitot tube and hot wires are discussed. The parameters varied were: nozzle pressure ratio, ejector area ratio, ejector throat to nozzle exit plane distance, and the number and spacing of the jets. Performance characteristics derived from ejector exit plane velocity distributions have been drawn for two area ratios. In addition, a fair reference base for comparison of results has been established, by conducting identical tests on an equivalent single jet ejector. Results show that there is little difference between the two ejectors at subsonic conditions of operation. However, at underexpanded discharge conditions, a compact multiple jet ejector is distinctly superior. Mixing characteristics are better in such an ejector, even though the acoustic effects responsible for mixing in a single jet are almost insignificant. The location of the ejector throat has a strong effect on the ability of the ejector to entrain the ambient fluid. The best performance is obtained for the location closest to the nozzle exit. The number and spacing of the jets do not have a significant effect for the range of values studied. GRA

N85-19376# Physical Sciences, Inc., Andover, Mass.

EXPERIMENTAL AND THEORETICAL STUDY OF CONDENSATION IN MULTICOMPONENT VAPORS Quarterly Report, 15 May - 14 Aug. 1984

M. B. Frish and G. Wilemski Sep. 1984 13 p refs

(Contract DE-AC02-84ER-13154)

(DE85-000843; PSI-TR-463; QR-2) Avail: NTIS HC A02/MF A01

Condensation in multicomponent vapors was studied. Construction of the supersonic flow laser light scattering experiment is discussed. Calculations of nucleation onset conditions were performed for the n-propanol/water system using the new revised classical theory of binary nucleation. Some differences between the results of these calculations and previous results for the water/methanol and water/ethanol systems are discussed. DOE

N85-19377# Los Alamos Scientific Lab., N. Mex.

ANALYSIS OF COMPACT HEAT EXCHANGER PERFORMANCE

Sunil Sarangi and John A. Barclay 1984 26 p refs Presented at the ASME Winter Ann. Meeting, New Orleans, 9-13 Dec. 1984

(Contract W-7405-eng-36)

(DE84-012624; LA-UR-84-1477; CONF-841201-8) Avail: NTIS HC A03/MF A01

Many cryogenic heat exchangers employ high-conductance metallic screens or perforated plates separated by insulating spacers normal to the fluid flow direction. Packed-bed regenerators employing wire screens, perforated plates, or granular particles also have a similar structure. The temperature profile along the length consists of many steps. The ineffectiveness due to axial conduction adds to that due to finite number of plates and finite heat transfer coefficient. A closed form expression is derived for the efficiency of a compact heat exchanger with given design N sub tu where the exchanger consists of layers of metallic screens, plates, or particle layers. It is observed that the effect of discrete temperature profile becomes significant when the per stage design N sub tu exceeds about 0.5. DOE

N85-19378# Massachusetts Inst. of Tech., Cambridge.

STUDY OF DEPOSITION CONTROL USING TRANSPIRATION Technical Progress Report

Jean F. Louis and Hamdi Kozlu Oct. 1984 6 p

(Contract DE-AC21-83MC-20334)

(DE85-002339; DOE/MC-20334/T12) Avail: NTIS

HC A02/MF A01

The introductory experimental phase of a study to determine the conditions under which transpiration may be used to avoid the deposition of small particles was undertaken. The application of this work is to control the deposition of small particles over a surface kept at a temperature below the melting point of compounds likely to exist in the combustion products. Laser beam attenuation methods were used to measure the distribution of glass beads, ranging in size from 1 to 37 microns in a wind tunnel's flow atmosphere. The method of laser beam attenuation measurements is sound and gives indications of its suitability for continued use in modeling applications of this nature. G.L.C.

N85-19379# Los Alamos Scientific Lab., N. Mex.
TVENT1P USER'S MANUAL, A COMPUTER CODE FOR ANALYZING TORNADO INDUCED GAS DYNAMIC TRANSIENTS IN FLOW NETWORKS
R. W. Andrae, P. K. Tang, and W. S. Gregory Sep. 1984 150 p
(Contract W-7405-eng-36)
(DE85-002346; LA-10237-M) Avail: NTIS HC A07/MF A01

TVENT1P is a revised version of the TVENT computer code, which was designed to predict the flows and pressures in a ventilation system subjected to a tornado. TVENT1P is essentially the same code, but a material transport algorithm and features for turning blowers off and on, changing blower speeds, and changing the resistance of dampers and filters were added. These features make it possible to depict a sequence of events during a single run. Other features were added to make the code more versatile. Example problems are included to demonstrate applications for TVENT1P. DOE

N85-19380# Oak Ridge National Lab., Tenn.
OPTIMIZATION OF A GROUND COUPLED HEAT PUMP
V. D. Baxter and M. A. Catan (Brookhaven National Lab.) 1984 12 p refs Presented at the 7th Heat Pump Technol. Conf., Tulsa, Okla., 15 Oct. 1984
(Contracts DE-AC02-76CH-00016; DE-AC05-84OR-21400)
(DE85-000273; CONF-8410153-1) Avail: NTIS HC A02/MF A01

A cooperative analytical project has optimized a horizontal ground coil heat pump system for the Pittsburgh climate. This is the first step in the exploration of several advanced designs including various ground coil devices and advanced heat pump components. The project made use of new and existing design tools to simulate system performance and determine first cost. The system life cycle cost was minimized while constraining the system to meet the design day cooling load using a function minimizing program. Among the system parameters considered were: air-to-refrigerant frontal area, air-to-refrigerant fin pitch, air-to-refrigerant air flowrate, compressor displacement, liquid-to-refrigerant coil length, liquid-to-refrigerant coil diameter, ground coil fluid flowrate, ground coil length, and ground coil depth are described. DOE

N85-19381# Stanford Univ., Calif. Dept. of Civil Engineering.
MOMENTUM AND HEAT TRANSFERS IN A COMPLEX, BUT WELL-DEFINED TURBULENT FLUID FLOW Final Report
12 Nov. 1984 35 p refs
(Contract DE-AT03-81ER-10867)
(DE85-002857; DOE/ER-10867/T1) Avail: NTIS HC A03/MF A01

The lid-driven flow in a rectangular cavity was studied in an effort to better understand and predict turbulent, mixed convection, recirculating flows. Liquid crystals were used to determine flow patterns and temperature distribution simultaneously. Longitudinal vortices were observed in the flow and their effects on heat transfer were qualitatively demonstrated. The two- and three-dimensional codes developed failed to reproduce the key features of the flow. Principal activities reported include studies of: (1) three-dimensional lid-driven cavity flow; (2) visual studies of a shear driven three-dimensional recirculating flow; (3) flow visualization of a recirculating flow by rheoscopic liquid and liquid crystal techniques; (4) mixing in a stratified recirculating flow; and (5) flow visualization and heat flux measurement in a three-dimensional recirculating flow are given. A.R.H.

N85-19382# Battelle Columbus Labs., Ohio.
AN ASSESSMENT OF GROUND-COIL HEAT-PUMP TECHNOLOGY
Robert D. Fischer, George H. Stickford, and Frank E. Jakob 1984 19 p refs Presented at the Oklahoma State Heat Pump Technol. Conf., Tulsa, Okla., 15-16 Oct. 1984
(Contract DE-AC05-84OR-21400)
(DE85-002567; CONF-8410153-2) Avail: NTIS HC A02/MF A01

Results from an analytical comparison of the performance and economics of residential space conditioning with three types of ground coupled heat pump systems and air source systems in ten metropolitan areas of the United States are summarized. Additional results from parametric analyses of the effects of costs, soil properties, operating strategy and alternate system configurations are also summarized. DOE

N85-19383# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
DEVELOPMENT AND DEMONSTRATION OF A STIRLING/RANKINE HEAT ACTIVATED HEAT PUMP. PHASE 3B: ENGINE TECHNOLOGY DEVELOPMENT TESTING Final Report
Nov. 1984 203 p refs
(Contract DE-AC05-84OR-21400)
(DE85-004388; ORNL/Sub-82-17485/1) Avail: NTIS HC A10/MF A01

The results of the Phase 3B Stirling/Rankine Heat Activated Heat Pump product development program are given. Results of the Phase 2 program indicated deficiencies in the performance of the free-piston Stirling engine and mismatching of the dynamic characteristics of the engine and the compressor. These deficiencies were further investigated during in-depth diagnostic testing of the engine/compressor unit in the Phase 3B and indicated appropriate engine/compressor matching criteria. DOE

N85-19384# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
HEAT AND MASS EXCHANGE IN A PARTIALLY STRATIFIED FLUID
F. Zangrando, J. Green, and E. Fisher Sep. 1984 7 p refs Presented at the 22nd Natl. Heat Transfer Conf., Niagara Falls, N.Y., 5 Aug. 1984
(Contract DE-AC02-83CH-10093)
(DE85-000528; SERI/TP-252-2295; CONF-840816-24) Avail: NTIS HC A02/MF A01

The process of heat temperature and salinity was investigated. The test cell was insulated and bottom heated. The stably stratified region (gradient) was established over approximately one half the depth of the test tank, while the remaining depth was initially at a constant, high density (storage or mixed region). Fluid from the mixed region was withdrawn, circulated through an external heat exchanger, and returned at a lower temperature. Tests were primarily aimed at identifying the effects of the recirculating flow on the interface between gradient and storage regions, and determining the maximum rate at which energy can be extracted from such systems, with direct application to energy extraction from salt gradient solar ponds. In addition to the expected dependence on Richardson number a dependence on the stability number near the interface is indicated. Critical conditions and parameter ranges in which no net erosion of the interface was observed are also discussed. DOE

N85-19466# Joint Publications Research Service, Arlington, Va.
DISCOVERY ABOUT TEMPERATURE FLUCTUATIONS IN TURBULENT AIR FLOWS Abstract Only
In its USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 30 Transl. into ENGLISH from Vechernyaya Mosk. (Moscow), 19 Oct. 1984 p 2 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N85-19385# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

BRAZILIAN REMOTE SENSING SHUTTLE EXPERIMENT (BRESEX): CHARACTERISTICS AND FUTURE UTILIZATION ON SATELLITES

Nelson de Jesus Parada Oct. 1984 11 p Presented at the 18th Intern. Symp. on Remote Sensing of the Environment, Paris, 1-5 Oct. 1984

(INPE-3313-PRE/620) Avail: NTIS HC A02/MF A01

Brazilian Space Program plans include the design, manufacturing, launching, operation of four satellites, two of which are designated for the remote sensing of Earth. A cooperative experiment with NASA provides the opportunity to use, in space, a prototype of the imaging instrument designed for these satellites. The objective of the Brazilian Remote Sensing Experiment (BRESEX) to be carried on space shuttle are listed. Specifications for the CCD, pushbroom mode, multispectral band camera are considered. A.R.H.

N85-19386# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE BRESEX MULTISPECTRAL CAMERA: PRELIMINARY CHARACTERISTICS

Marcus Antonius Andrade Siqueira, Ronald Ranvaud, Amauri Silva Montes, Antonio LopesFilho, Govindaraju K. Rayalu, Jose Dias Matos, and Paolo Pio Gabrieli Camilli Dec. 1984 9 p Presented at the 4th SELPER Meeting, Santiago de Chile, 12-16 Nov. 1984

(INPE-3357-PRE/635) Avail: NTIS HC A02/MF A01

A Multispectral Camera which will be integrated into the Brazilian Remote Sensing Experiment (BRESEX) is described. The camera is envisaged to fly on board the Space Shuttle in the first half of 1987. The camera will have three spectral bands in the visible and near infrared and a ground resolution of 20 meters for a flight altitude of 300 kilometers. It will use pushroom imaging technology with silicon Charge Coupled Device (CCD) linear arrays as sensors. Author

N85-19387# Department of the Air Force, Washington, D.C.

DIFFRACTION DIFFUSION SCREEN WITH HOLOGRAPHICALLY-SUPPRESSED ZERO-ORDER BEAM Patent Application

M. J. Chern, inventor (to Air Force) Filed 1 Nov. 1984 14 p

(AD-D011445; US-Patent-Appl-SN-667194) Avail: NTIS HC A02/MF A01 CSCL 20/6

A diffusing screen (50, 50 ft, 50 in, 102) of a transmission hologram (54, 80, 94, 112) located adjacent to a diffraction optics directional diffusing screen (52, 86, 92, 114) supresses zero-order light from the diffusing screen thereby providing a device having the advantages of a directional diffusing screen but which does not have the disadvantages associated with zero-order light. GRA

N85-19388# Aerodyne Research, Inc., Billerica, Mass.

STUDY OF SUBMICRON PARTICLE SIZE DISTRIBUTIONS BY LASER DOPPLER MEASUREMENT OF BROWNIAN MOTION Annual Report, 1 Sep. 1983 - 30 Sep. 1984

A. C. Stanton and W. K. Cheng 29 Oct. 1984 51 p

(Contract F49620-83-C-0154)

(AD-A149139; ARI-RR-423; AFOSR-84-1169TR) Avail: NTIS HC A04/MF A01 CSCL 21/2

Few nonintrusive techniques are available for particle measurements in the submicron size range (< 0.1 micrometer diameter), yet measurement of these particles is basic to an understanding of important processes in combustion, such as soot formation and oxidation. The objective of the present research is the development and application of a technique for measurement of individual submicron particles in a gas stream. The approach is to measure the inertial relaxation time of individual particles in Brownian motion, by statistical analysis of the time-resolved (100 MHz) heterodyne signal obtained in an interferometer system resembling a more conventional laser Doppler velocimeter. Progress to date has included the development of an optical system and fast data acquisition system for conducting the experimental studies. A detailed Monte Carlo numerical simulation of the Brownian motion of isolated particles has been developed and applied to the calculation of the time dependent signals expected in the experiment. These simulated signals have been analyzed for correlations between the particle size and statistical properties of the signal. The mean time between signal extrema has been found to be a proportional to the square root of the product of the particle relaxation time, a quantity which is proportional to the particle diameter, and the data sampling interval. Continuing research on this program will be initially focused on validation of the experimental approach, by statistical analysis of signals obtained with the interferometer for particles of known size. Following the demonstration of this approach, the technique will be applied to the study of the size evolution of combustion particulates. GRA

N85-19389# Naval Research Lab., Washington, D. C.

PROCEEDINGS OF THE 15TH ANNUAL PRECISE TIME AND TIME INTERVAL (PTTI) APPLICATIONS AND PLANNING MEETING

J. A. Murray 2 Apr. 1984 767 p Proc. held in Washington, D.C., 6-8 Dec. 1983

(AD-A149163) Avail: NTIS HC A99/MF A01 CSCL 05/9

These proceedings contain the papers presented at the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting, including questions and answers following presentations. The purpose of the meeting was to give PTTI managers, systems engineers, and program planners a transparent view of the state of the art, and opportunity to express needs, a view of important future trends, and a review of relevant past accomplishments; to provide PTTI users with new and useful applications, procedures, and techniques; to allow the PTTI researcher to better assess fruitful directions for research efforts. GRA

N85-19390# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

A GENERALIZED ORDERING CONSTRAINT FOR STEREO CORRESPONDENCE

A. L. Yuille and T. Poggio May 1984 27 p

(Contract N00014-80-C-0505)

(AD-A149182; AI-M-777) Avail: NTIS HC A03/MF A01 CSCL 14/5

The ordering constraint along epipolar lines is a powerful constraint that was exploited by some recent stereomatching algorithms. A generalized ordering constraint, not restricted to epipolar lines was formulated. Several properties of the generalized ordering constraint and of the forbidden zone, the set of matches that would violate the constraint were proved. Both the orthographic and the perspective projection case were considered, the latter for a simplified but standard stereo geometry. The disparity gradient limit found in the human stereo system may be related to a form of the ordering constraint. To illustrate the analysis a simple algorithm was outlined that exploits the generalized ordering constraint for matching contours of wireframe objects. The use of the generalized ordering constraint implies several other stereo matching constraints: (1) the ordering constraint along epipolar lines, (2) figural continuity, (3) Binford's cross-product constraint, and (4) Mayhew and Frisby's figural continuity constraint. Finally ways of extending the algorithm to arbitrary 3-D objects were discussed. B.G.

N85-19391# Little (Arthur D.), Inc., Cambridge, Mass.
A VALIDATED METHODOLOGY FOR DETERMINATION OF LABORATORY INSTRUMENT COMPUTER INTERFACE EFFICACY Final Report, 15 Dec. 1983 - 5 Dec. 1984
10 Dec. 1984 30 p
(Contract MDA903-84-C-0041)
(AD-A149338; Rept-0041-1-UEA-LAB-INS) Avail: NTIS HC A03/MF A01 CSCL 14/2

This report is intended to provide a methodology for determining when, and for which instruments, direct interfacing of laboratory instrument and laboratory computers is beneficial. This methodology has been developed to assist the Tri-Service Medical Information Systems Program Office in making future decisions regarding laboratory instrument interfaces. We have calculated the time savings required to reach a break-even point for a range of instrument interface prices and corresponding average annual costs. The break-even analyses used empirical data to estimate the number of data points run per day that are required to meet the break-even point. The results indicate, for example, that at a purchase price of $3,000, an instrument interface will be cost-effective if the instrument is utilized for at least 154 data points per day if operated in the continuous mode, or 216 points per day if operated in the discrete mode. Although this model can help to ensure that instrument interfaces are cost effective, additional information should be considered in making the interface decisions. A reduction in results transcription errors may be a major benefit of instrument interfacing. GRA

N85-19392# Department of the Navy, Washington, D. C.
DYNAMIC PRESSURE TEST UNIT-RATIO METHOD Patent Application
P. R. Tkachuk, inventor (to Navy) Filed 2 Feb. 1984 14 p
(AD-D011466; US-Patent-Appl-SN-576229) Avail: NTIS HC A02/MF A01 CSCL 14/2

A dynamic pressure test unit is utilized to determine the yield point of a flask. For a period of time prior to the yield point being reached the ratio of the pressure vs. volume of water pumped into a test flask assumes a constant value. After reaching the yield point the volume indication increases at a faster rate than the pressure giving negative slope to a line on a stripchart recorder that indicates the pressure divided by the volume of water pumped into the flask. GRA

N85-19393# Department of the Air Force, Washington, D.C.
CHARGE DEPLETION METER Patent Application
J. F. Schneider, inventor (to Air Force) Filed 27 Nov. 1984 13 p
(AD-D011484; US-Patent-Appl-SN-675174) Avail: NTIS HC A02/MF A01 CSCL 10/3

This invention relates to a charge depletion meter apparatus having a current to frequency converter to sense and convert the current drain of a battery source to a digital signal which is divided and then accumulated in a counter. An LCD display unit displays the accumulated charge which is received from the counter. GRA

N85-19394# Los Alamos Scientific Lab., N. Mex. Applied Theoretical Physics Div.
MONTE CARLO SIMULATION OF GAS CERENKOV DETECTORS
Joseph M. Mack, Mahavir Jain, and Thomas M. Jordan (Experimental and Mathematical Phys. Consultants) 1984 4 p refs Presented at the Nucl. Sci. Symp., Orlando, Fla., 31 Oct. - 2 Nov. 1984
(Contract W-7405-eng-36)
(DE85-002422; LA-UR-84-3391; CONF-841007-10) Avail: NTIS HC A02/MF A01

A Cerenkov production model and its incorporation into a general geometry Monte Carlo coupled electron/photon transport code is discussed. A special optical photon ray-trace is implemented using bulk optical properties assigned to each Monte Carlo zone. Good agreement exists between experimental and calculated Cerenkov data in the case of a carbon-dioxide gas Cerenkov detector experiment. Cerenkov production and threshold data are presented for a typical carbon-dioxide gas detector that converts a 16.7 MeV photon source to Cerenkov light, which is collected by optics and detected by a photomultiplier. DOE

N85-19395# GA Technologies, Inc., San Diego, Calif.
IMPROVED PERFORMANCE FOR LARGE AREA TRIPLE LAYER MICROCHANNEL PLATE DETECTOR FOR A NEUTRAL SPECTROMETER IN DOUBLET III
C. J. Armentrout Sep. 1984 13 p refs Presented at the 5th APS Topical Conf. on High Temp. Plasma Diagnostics, Tahoe City, Calif., 16-20 Sep. 1984
(Contract DE-AT03-84ER-51044; GA Proj. 3410)
(DE85-001719; GA-A-17706; CONF-840922-13) Avail: NTIS HC A02/MF A01

A 2 cm x 30 cm 3 layer, microchannel plate (MCP) assembly was constructed with 120 anodes to collect electrons. It has a gain of up to 5 x 10 to the 8th power in the pulse counting mode. The device displays an unexpectedly high per anode count rate. The original device had major problems: 5 x gain variation along its length and 150% FWHM/gain ratio. It is shown through a model distribution function that both effects can be due to the space change limiting of pulses that cross the interstage gaps. One detector was rebuilt with greatly reduced interstage gaps and now displays 60% FWHM/gain and a 30% gain variation. This has significantly improved the pulse counting capability of the spectrometer. DOE

N85-19396# California Univ., Livermore. Lawrence Livermore Lab.
A MICROCHANNEL PLATE PINHOLE CAMERA FOR 20 TO 100 keV X-RAY IMAGING
C. L. Wang, G. R. Leipelt, and D. G. Nilson 3 Oct. 1984 11 p ref Presented at the Am. Phys. Soc. 5th Topical Conf. on High Temp. Plasma Diagnostics, Tahoe City, Calif., 16-20 Sep. 1984
(Contract W-7405-eng-48)
(DE85-001572; UCRL-91223; CONF-840922-12) Avail: NTIS HC A02/MF A01

The design and construction of a sensitive pinhole camera for imaging suprathermal X-rays are presented. The device is a pinhole camera consisting of four filtered pinholes and microchannel plate electron multiplier for X-ray detection and signal amplification. Successful imaging of 20, 45, 70, and 100 keV X-ray emissions from the fusion targets at the Novette laser facility is reported. Such imaging reveals features of the transport of hot electrons and provides views deep inside the target. DOE

N85-19397# Oak Ridge Y-12 Plant, Tenn.
PROBLEMS IN HIGH TEMPERATURE THERMOCOUPLE THERMOMETRY
T. G. Kollie and R. L. Anderson (ORNL) 16 Oct. 1984 25 p refs Presented at the Ind. Temp. Meas. Conf., Knoxville, Tenn., 10-12 Sep. 1984 Submitted for publication
(Contract DE-AC05-84CS-21400)
(DE85-000808; Y/DV-361-1; CONF-8409109-4) Avail: NTIS HC A02/MF A01

Thermocouples are the most common thermometers used in science and industry for high temperature measurements. Contrary to common belief, thermocouples are not a panacea for high temperature thermometry, for they too have significant problems associated with their use. Accurate temperature measurements with these instruments can be achieved only when their applications are planned carefully. With the instruments now available, accurate thermocouple thermometry above 1200 C is a herculean task. The error sources in high temperature thermocouple thermometry can be divided into seven categories: thermal shunting errors, electrical shunting errors, calibration errors, decalibration errors, extension wire errors, reference junction errors, and data acquisition errors. Each error source is described in this paper, specifically: the temperature intervals in which each source is operative; the magnitudes of the sources; difference in sources for various types of thermocouples and environments; and where possible, methods for minimizing, calculating, or measuring the magnitude of the errors, to aid in a more fundamental understanding of error sources,

a brief review of the theory of thermocouple thermometry precedes the discussion of the error sources. DOE

N85-19398# Los Alamos Scientific Lab., N. Mex.
X-RAY HOLOGRAPHY OF BIOLOGICAL SPECIMENS
J. C. Solem 1984 11 p refs Presented at the 9th Intern. Congr. on Photobiol., Philadelphia, 3 Jul. 1984
(Contract W-7405-eng-36)
(DE85-002437; LA-UR-84-3340; CONF-840783-3) Avail: NTIS HC A02/MF A01

The techniques presently being used for X-ray microscopy are reviewed and reasons for X-ray imaging of biological specimens are given. The advantages of X-ray holography are discussed. The problems of radiation damage are discussed. Efforts underway to develop high intensity coherent X-ray sources for the laboratory are described. DOE

N85-19399# GA Technologies, Inc., San Diego, Calif.
SEQUENTIALLY-FRAMING SOFT X-RAY PINHOLE CAMERA FOR TOKAMAK PLASMA STUDIES
A. J. Lieber and R. Snider Sep. 1984 11 p refs Presented at 5th APS Topical Conf. on High Temp. Plasma Diagn., Tahoe City, Calif., 16 Sep. 1984
(Contract DE-AT03-84ER-51044)
(DE85-001717; GA-A-17713; CONF-840922-15) Avail: NTIS HC A02/MF A02

X-ray camera techniques developed in laser fusion were applied to view Tokamak discharges in 1 to 3 keV light. The camera consists of an image intensifier fluor combination viewing the plasma tangentially through a pinhole. The resultant image is optically coupled to a standard CCD television camera for remote viewing. The first intensifier is gated so that the camera produces a sequence of photos every 16 milliseconds of variable frame duration from 16 ms to 10 microseconds. DOE

N85-19400# Argonne National Lab., Ill. Materials Science and Technology Div.
CALCULATION OF Si(Li) X-RAY DETECTOR EFFICIENCIES
N. J. Zaluzec and R. J. Holton Oct. 1984 21 p refs Presented at Microbeam Analysis Soc. Analytical Electron Microscop. Meeting, Bethlehem, Pa., 19 Jul. 1984
(Contract W-31-109-eng-38)
(DE85-002732; CONF-840767-10) Avail: NTIS HC A02/MF A01

A reliable set of parameterizations for the calculation of detector efficiency functions for Si (Li) X-ray detector systems is presented. The recent data on light element mass absorption coefficients were interrogated and a new parameterization for these coefficients was established. Using these equations a simple table of detector efficiency factors is given which can be used to calculate the relative detection efficiency of any X-ray line in the energy range of 0.2 to 40 keV. The table is valid for windowless, ultrathin and beryllium window detectors and allows specification of the various window thicknesses. DOE

N85-19401# Argonne National Lab., Ill.
LINEAR, POSITION-SENSITIVE X-RAY DETECTOR USED FOR REAL-TIME CALCULATIONS OF SMALL-ANGLE SCATTERING PARAMETERS WITH SUBMILLISECOND RESOLUTION
C. S. Borso 1984 4 p refs Presented at the Symp. on Polymer Res. at Synchrotron Radiation Sources, Upton, N.Y., 29 Oct. 1984
(Contract W-31-109-eng-38)
(DE85-002530; CONF-8410112-2) Avail: NTIS HC A02/MF A01

The advent of high intensity X-ray synchrotron sources has made possible the measurement of fluctuations in small angle scattering parameters from typical specimens on a submillisecond time scale in real time. The fundamental design of any fast detector system optimized for such measurements will incorporate some type of solid state detector array capable of rapid encoding algorithms. A prototype with a self scanning photodiode array has been designed and tested at beamline 1 to 4 at the Stanford Synchrotron Radiation Laboratory (SSRL), and the results indicate that the device will operate at speeds yielding submillisecond temporal resolution in real time. DOE

N85-19462# Joint Publications Research Service, Arlington, Va.
PROCESSING OF UNDERWATER PHOTOGRAPHS Abstract Only
Ye. A. Melina *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 26 Transl. into ENGLISH from Geod. I Kartografiya (Moscow), no. 8, Aug. 1984 p 44-46 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-19402# KMS Fusion, Inc., Ann Arbor, Mich.
TWO-STAGE FREE ELECTRON LASER RESEARCH Annual Summary Report, 1 Oct. 1983 - 30 Sep. 1984
S. B. Segall 24 Oct. 1984 30 p
(Contract N00014-80-C-0614)
(AD-A148951; KMSF-U1526) Avail: NTIS HC A03/MF A01 CSCL 20/5

KMS Fusion, Inc. began studying the feasibility of two-stage free electron lasers for the Office of Naval Research in June, 1980. At that time, the two-stage FEL was only a concept that had been proposed by Luis Elias. The range of parameters over which such a laser could be successfully operated, attainable power output, and constraints on laser operation were not known. The primary reason for supporting this research at that time was that it had the potential for producing short-wavelength radiation using a relatively low voltage electron beam. One advantage of a low-voltage two-stage FEL would be that shielding requirements would be greatly reduced compared with single-stage short-wavelength FEL's. If the electron energy were kept below about 10 MeV, X-rays, generated by electrons striking the beam line wall, would not excite neutron resonance in atomic nuclei. These resonances cause the emission of neutrons with subsequent induced radioactivity. Therefore, above about 10 MeV, a meter or more of concrete shielding is required for the system, whereas below 10 MeV, a few millimeters of lead would be adequate. GRA

N85-19403# Tel-Aviv Univ. (Israel).
THE AXIAL VELOCITY SPREAD ACCEPTANCE OF FREE ELECTRON LASERS Scientific Report, 15 Jun. 1982 - 14 Jun. 1984
A. Gover and E. Jerby 24 Jul. 1984 28 p Sponsored by Air Force
(AD-A149024; QE-3/84; AFOSR-84-1144TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

We present various criteria for the definition of axial velocity spread acceptance of free electron lasers (FEL), and provide analytical approximations, numerical calculations and design curves for this parameter in the low, high, and intermediate gain regimes. This parameter is used to calculate the energy spread acceptance, emittance acceptance and other e-beam quality parameters. A special emphasis is put on the design considerations of short wavelength (X-ray) FELs. For this reason, the parameters calculation in this work is limited to the tenuous beam regimes only, and parameters are calculated for intermediate and moderately high gain regimes, which correspond to the low quality factor of X-ray resonators in the present state of the art. GRA

N85-19404# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
A FREE ELECTRON LASER WITH A ROTATING QUADRUPOLE WIGGLER Interim Report, Oct. 1983 - Sep. 1984
B. Levush (Berkeley Assoc., Springfield, Va.), T. M. Antonsen (Maryland Univ., College Park), W. M. Manheimer, and P. Sprangle 31 Dec. 1984 38 p
(AD-A149052; NRL-MR-5471) Avail: NTIS HC A03/MF A01 CSCL 20/5

A new rotating quadrupole wiggler configuration for free-electron lasers is proposed. The stability analyses of the particles trajectories in a continuously rotating quadrupole magnetic field and self-fields of a solid beam is performed. The resulting orbit equations are solved exactly and it is shown that high-current beams can be confined. To analyze the potential of this wiggler for free electron lasers, a set of nonlinear orbit equations is derived which average over the fast time variation in both the wiggler and radiation fields. By integrating these equations, the linearized single particle gain of the free electron laser is calculated. It is shown that at comparable wiggler strengths, the rotating quadrupole wiggler and conventional wiggler give similar gains. Author (GRA)

N85-19405# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
PICOSECOND LASER PULSE INTERACTIONS WITH METALLIC AND SEMICONDUCTOR SURFACES Annual Progress Report, 1 Nov. 1983 - 31 Oct. 1984
N. Bloembergen and F. Spaepen 1 Nov. 1984 97 p
(Contract N00014-83-K-0030)
(AD-A149112; AD-E751159; APR-2) Avail: NTIS HC A05/MF A01 CSCL 20/5

Picosecond heating and cooling experiments on silicon surfaces are reported. The surfaces are probed by a picosecond pulse, following the heating pulse, as a function of wave length, time delay and energy fluence. Picosecond laser-induced transformations of modulated metal films extend the glass formation range. New glassy alloys have been formed. GRA

N85-19406# Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 66, JULY-AUGUST 1983
Sep. 1984 141 p 66 Vol.
(AD-A149113; AD-E751159; DIA-DST-2700Z-004-84) Avail: NTIS HC A07/MF A01 CSCL 20/5

This bibliography is the 66th in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical laser; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; adaptive optics; computer technology; holography; laser-induced chemical reactions; measurement of laser parameters; laser measurement applications; laser-excited optical effects; laser spectroscopy, beam-target interaction, and plasma generation and diagnostics. GRA

N85-19407# Ballistic Research Labs., Aberdeen Proving Ground, Md.
EXCIMER LASER PHOTOFRAGMENTATION OF ORGANO-PHOSPHONATES. 1: DETECTION OF THE PO RADICAL FROM DIMETHYL METHYL PHOSPHONATE (DMMP) Final Report
A. W. Miziolek, R. C. Sausa, and S. R. Long Nov. 1984 31 p
(DA Proj. 1L1-61102-A-71-A)
(AD-A149471; AD-F300536; BRL-TR-2611) Avail: NTIS HC A03/MF A01 CSCL 07/5

The argon fluoride (193 nm) and krypton fluoride (248 nm) lasers have been employed to photodissociate the chemical agent simulant DMMP at pressures up to 0.8 torr. Detection of the PO radical as a photolytic product was accomplished by laser-induced fluorescence. Both fluorescence and excitation spectra have been recorded and the A to X lifetime of PO has been determined to be 9 plus or minus 2 nsec. The multiphoton nature of the photodissociation is revealed by a near quadratic dependence of the PO laser-induced fluorescence on excimer laser power. The formation and detection of the PO radical is a critical element in the development of a chemical agent detection scheme involving pulsed ultraviolet laser photodissociation of agents. GRA

N85-19408# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
LASER HAZARDS BIBLIOGRAPHY, OCTOBER 1984
D. H. Sliney, P. K. Galoff, R. L. Wood, and S. Wood 31 Oct. 1984 207 p Supersedes report dated Aug. 1983
(AD-A149534) Avail: NTIS HC A10/MF A01 CSCL 20/5

The Laser Hazards Bibliography consists of 2,795 references in the open literature broken into subject categories which relate to general biological effects, the eye, the skin, laser safety, laser propagation in the atmosphere, and laser measurements. GRA

N85-19409# Department of the Navy, Washington, D. C.
IMPROVED OPERATION OF TRANSVERSELY EXITED N2O LASERS Patent Application
W. T. Whitney and H. Hara, inventors (to Navy) Filed 17 Sep. 1984 10 p
(AD-D011488; US-Patent-Appl-SN-651399) Avail: NTIS HC A02/MF A01 CSCL 20/5

This invention relates to an improved method and apparatus for producing high power, high efficiency pulsed TEA laser energy and N2O wavelengths by suppressing discharge arc formation with H2 or CO that is added to the N2O lasing medium. GRA

N85-19410# California Univ., Livermore. Lawrence Livermore Lab.
MODERN SOLID STATE LASER MATERIALS
William F. Krupke 20 Jun. 1984 36 p Presented at Conf. on Lasers and Electro-Optics (CLEO), Anaheim, Calif., 20 Jun. 1984
(Contract W-7405-eng-48)
(DE85-003665; UCID-20119) Avail: NTIS HC A03/MF A01

Visual aids used in an invited talk entitled Modern Solid State Laser Materials are presented. Interest at LLNL in solid state lasers focuses on evaluating the potential inertial fusion power production. The relevant bulk material parameters characterizing average power capacity are identified and chromium and neodymium co-doped gadolinium scandium gallium garnet (Nd:Cr:GSGG) are used as an example of a laser material with improved laser properties relative to Nd:YAG (plausible large scale growth, more efficient spectral coupling to xenon flashlamp radiation, reduced stimulated emission cross section, adequate thermal shock and optical damage threshold parameters, etc.). Recently measured spectroscopic, kinetic, and thermomechanical properties of Nd:Cr:GSGG are given. DOE

N85-19411# GA Technologies, Inc., San Diego, Calif.
CO2 LASER INTERFEROMETER ARRAY FOR BIG DEE
E. S. Fairbanks Sep. 1984 17 p refs Presented at 5th APS Topical Conf. on High Temp. Plasma Diagnostics, Tahoe City, Calif., 16 Sep. 1984
(Contract DE-AT03-84ER-51044)
(DE85-001718; GA-A-17708; CONF-840922-16) Avail: NTIS HC A02/MF A01

A twelve channel interferometer array is planned for obtaining electron density profiles of Big Dee. Each channel consists of coaxial CO2 and HeNe laser beams. The reference beam is formed by splitting off half of the laser power at each wavelength by using acousto-optic modulators which introduce a 40 MHz frequency shift in the reference beam. The detected interference signals from room temperature visible and IR detectors are mixed with the 40 MHz drive for the acousto-optic cells. The quadrature mixer signals result in phase information due to vibration and phase velocity variation in the plasma. Simultaneous solution of the two equations describing the phase shift at the two wavelengths yields the phase shift due only to the plasma effects. The arithmetic operations are to be performed digitally in real time by a dedicated microprocessor in each channel. Density profiles are derived from chordal line integral density data by computer tomography. R.S.F.

N85-19412# California Univ., Livermore. Lawrence Livermore Lab.
LASER PROGRAM ANNUAL REPORT 1983
C. D. Hendricks, ed., M. L. Rufer, ed., and P. W. Murphy, ed. Jun. 1984 466 p refs
(Contract W-7405-eng-48)
(DE84-017287; UCRL-50021-83) Avail: NTIS HC A21/MF A01

The accomplishments and unclassified activities of the laser

program at Lawrence Livermore National Laboratory (LLNL) for the year 1983 are presented in a brief form, but with sufficient depth to provide an overview of the analtyical and experimental aspects of the LLNL inertial-confinement fusion (ICF) program. The important accomplishments and directions of the program are highlighted. Detailed information is provided on the various major parts of the program: laser systems and operations, target design, target fabrication, fusion experiments, laser research and development, and energy applications. R.S.F.

N85-19413# Florida Univ., Gainesville. Dept. of Physics.
STUDY OF OPACITY EFFECTS ON LINE RADIATION FROM PELLET IMPLOSIONS Final Technical Report, 11 Oct. 1981 - 31 Dec. 1983
C. F. Hooper, Jr. Jun. 1984 11 p refs
(Contract DE-AS08-82DP-40170)
(DE85-000380; DOE/DP-40170/1) Avail: NTIS HC A02/MF A01

Glass microballoons filled with mixtures of Argon and Neon were imploded using the University of Rochester 24-beam Omega Laser system. Experimentally observed Lyman-series X-ray lines of Ar(+17) and Ar(+16) were analyzed to determine plasma core parameters and the effects of opacity on spectroscopic diagnostics. The helium like satellites to the Lyman (ALPHA) resonance line of Ar(+17) and lilthium-like satellites of the Lyman (ALPHA) resonance line of Ar(+16) were resolved using an iterative peak finding code. Measured satellite line ratios were compared to new theoretical calculations in order to diagnose electron density. These calculations use a rate equation model for the satellite level populations and include the effects of autoionization, collisional mixing inner shell excitation, and collisional ionization (and the respective inverse processes). Densities inferred in this manner from satellite line ratios are compared with densities obtained from the Stark and opacity broadening analysis. DOE

N85-19414# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Lasertechnik.
INFLUENCE OF DEPOLARIZATION OF LINEAR POLARIZED RADIATION ON HETERODYNE DETECTION IN LASER RANGE FINDERS
Friedrich Malota Nov. 1983 25 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-903)
(DFVLR-FB-84-31) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 10

The relation between depolarization and heterodyne current of a heterodyne detection equipment was derived. Experimental results for different surfaces were compared with the theory.
Author (ESA)

N85-19109# Joint Publications Research Service, Arlington, Va.
EXCITATION MODES AND PARAMETERS OF STRESS WAVES IN METAL EXPOSED TO SINGLE LASER PULSES Abstract Only
V. I. Averin, A. I. Avrov, B. I. Gromov, M. V. Yerofeyev, A. A. Kalin, and I. A. Leontyev *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 19 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 2, Mar. - Apr. 1984 p 23-27 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19229*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGHLY EFFICIENT Nd:YAG LASERS FOR FREE-SPACE OPTICAL COMMUNICATIONS
D. L. Sipes, Jr. *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 31-39 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20E

N85-19245*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HISTORICAL COST CURVES FOR HYDROGEN MASERS AND CESIUM BEAM FREQUENCY AND TIMING STANDARDS
D. S. Remer and R. C. Moore *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 220-228 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-19415*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
THE DEVELOPMENT OF A MICROPROCESSOR-CONTROLLED LINEARLY-ACTUATED VALVE ASSEMBLY
Raymond H. Wall May 1984 164 p refs Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-955731)
(NASA-CR-174437; JPL-9950-976; NAS 1.26:174437) Avail: NTIS HC A08/MF A01 CSCL 13K

The development of a proportional fluid control valve assembly is presented. This electromechanical system is needed for space applications to replace the current proportional flow controllers. The flow is controlled by a microprocessor system that monitors the control parameters of upstream pressure and requested volumetric flow rate. The microprocessor achieves the proper valve stem displacement by means of a digital linear actuator. A linear displacement sensor is used to measure the valve stem position. This displacement is monitored by the microprocessor system as a feedback signal to close the control loop. With an upstream pressure between 15 and 47 psig, the developed system operates between 779 standard CU cm/sec (SCCS) and 1543 SCCS.
R.S.F.

N85-19416*# Texas A&M Univ., College Station. Turbomachinery Labs.
THEORY VERSUS EXPERIMENT FOR THE ROTORDYNAMIC COEFFICIENTS OF ANNULAR GAS SEALS. PART 2: CONSTANT CLEARANCE AND CONVERGENT-TAPERED GEOMETRY
Clayton C. Nelson, Dara W. Childs, Colby Nicks, and David Elrod [1985] 24 p refs
(Contracts NAS8-33716; F49620-82-K-0033)
(NASA-CR-174413; NAS 1.26:174413) Avail: NTIS HC A02/MF A01 CSCL 11A

The leakage and rotordynamic coefficients of constant-clearance and convergent-tapered annular gas seals were measured in an experimental test facility. The results are presented along with the theoretically predicted values. Of particular interest is the prediction that optimally tapered seals have significantly larger direct siffness than straight seals. The experimental results verify this prediction. Generally the theory does quite well, but fails to predict the large increase in direct stiffness when the fluid is pre-rotated. Author

N85-19417*# Texas A&M Univ., College Station. Turbomachinery Labs.
THEORY VERSUS EXPERIMENT FOR THE ROTORDYNAMIC COEFFICIENTS OF ANNULAR GAS SEALS. PART 1: TEST FACILITY AND APPARATUS
Dara W. Childs, Clayton E. Nelson, Colby Nicks, Joseph Scharrer, David Elrod, and Keith Hale [1983] 32 p refs
(Contracts NAS8-33716; F49620-82-K-0033)
(NASA-CR-174409; NAS 1.26:174409) Avail: NTIS HC A02/MF A01 CSCL 11A

A facility and apparatus are described for determining the rotordynamic coefficients and leakage characteristics of annular gas seals. The apparatus has a current top speed of 8000 cpm with a nominal seal diameter of 15.24 cmn (6 in). The air supply unit yields a seal pressure ratio of approximately 7. An external

shaker is used to excite the test rotor. The capability to independently calculate all rotordynamic coefficients at a given operating condition with one excitation frequency are discussed.
Author

N85-19418# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
PLANNING OF MINIMUM-TIME TRAJECTORIES FOR ROBOT ARMS
G. Sahar and J. M. Hollerbach Nov. 1984 25 p
(Contracts N00014-81-C-0494; N00014-80-C-0505; N00014-82-K-0334)
(AD-A148956; AI-M-804) Avail: NTIS HC A02/MF A01 CSCL 12/1

The minimum-time path for a robot arm has been a long-standing and unsolved problem of considerable interest. We present a general solution to this problem that involves joint-space tesselation, a dynamic time-scaling algorithm, and graph search. The solution incorporates full dynamics of movement and actuator constraints, and can be easily extended for joint limits and workspace obstacles, but is subject to the particular tesselation scheme used. The results presented show that, in general, the optimal paths are not straight lines, but rather curves in joint-space that utilize the dynamics of the arm and gravity to help in moving the arm faster to its destination. Implementation difficulties due to the tesselation and to combinatorial proliferation of paths are discussed. GRA

N85-19419# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
SIMPLIFIED GRASPING AND MANIPULATION WITH DEXTROUS ROBOT HANDS
R. S. Fearing Nov. 1984 18 p
(Contract F33615-82-K-5108)
(AD-A148962; AI-M-809) Avail: NTIS HC A02/MF A01 CSCL 09/3

A method is presented for stably grasping 2 dimensional polygonal objects with a dextrous hand when object models are not available. Basic constraints on object vertex angles are found for feasible grasping with two fingers. Local tactile information can be used to determine the finger motion that will reach feasible grasping locations. With an appropriate choice of finger stiffness, a hand can automatically grasp these objects with two fingers. The bounded slip of a part in a hand is shown to be valuable for adapting the fingers and object to a stable situation. Examples are given to show the ability of this grasping method to accommodate disturbance forces and to perform simple part reorientations and regrasping operations. GRA

N85-19420# Solar Turbines International, San Diego, Calif.
LOW LEAKAGE TURBINE SHAFT SEALS FOR ADVANCED COMBINED CYCLE SYSTEMS Final Report
G. W. Hosang Nov. 1984 144 p
(Contract N00024-78-C-5345)
(AD-A149372; AD-F300533; SR84-R-4622-36) Avail: NTIS HC A07/MF A01 CSCL 11/1

Advanced combined-cycle (COGAS) steam turbine overall system complexity and reliability can profit dramatically from low-leakage seals. The most critical seal locations are the high speed mainshaft seals at the bearings. The optimum seal system was selected as utilizing the feedwater as a buffer fluid. It was shown to be advantageous from at least seal performance, life and reliability standpoints. Three candidate late state-of-the-art low/zero leakage face seal assemblies were selected for manufacture and experimental test in a specially-modified test rig. Testing demonstrated that leakage rates from zero to 11 liters/day (3 gal/day) at speeds up to 92 m/sec (310 ft/sec) could be achieved at practical values of buffer pressure. These rates therefore met both the program objective of less than 11 liters/day (3 gal/day). Higher than anticipated parasitic drag was measured. A seal design which overcomes this drag was proposed. Limited cyclic endurance testing was carried out. Author (GRA)

N85-19421# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
ON MOTION PLANNING WITH UNCERTAINTY: REVISED
M. A. Erdmann 1984 262 p
(Contracts N00014-81-K-0494; N00014-80-C-0505)
(AD-A149521; AI-TR-810-Rev) Avail: NTIS HC A12/MF A01 CSCL 12/1

Robots must successfully plan and execute tasks in the presence of uncertainty. Uncertainty arises from errors in modelling, sensing, and control. Planning in the presence of uncertainty constitutes one facet of the general motion planning problem in robotics. This problem is concerned with the automatic synthesis of motion strategies from high level task specifications and geometric models of environments. In order to develop successful motion strategies, it is necessary to understand the effect of uncertainty on the geometry of object interactions. Object interactions, both static and dynamic, may be represented in geometrical terms. This thesis investigates geometrical tools for modelling and overcoming uncertainty. The thesis describes an algorithm for computing backprojections of desired task configurations. Task goals and motion states are specified in terms of a moving object's configuration space. Backprojections specify regions in configuration space from which particular motions are guaranteed to accomplish a desired task. The backprojection algorithm considers surfaces in configuration space that facilitate halt. GRA

N85-19422# Office of Naval Research, London (England).
FOURTH INTERNATIONAL CONFERENCE ON ROBOT VISION AND SENSORY CONTROLS
J. F. Blackburn 19 Nov. 1984 11 p Conf. held in London, 9-11 Oct. 1984
(AD-A149524; ONRL-C-8-84) Avail: NTIS HC A02/MF A01 CSCL 13/9

The Fourth International Conference on Robot Vision and Sensory Controls was held in London from 9 through 11 October 1984. The conference covered the following areas: sensor-based manufacturing, vision systems, sensor-guided welding, three-dimensional sensing, robot guidance and sensory control, nonvision sensing, knowledge-based sensory systems, and advanced vision techniques. Author (GRA)

N85-19423# Colorado School of Mines, Golden. Dept. of Metallurgical Engineering.
THE EFFECT OF FILLER WIRE AND FLUX COMPOSITIONS ON THE MICROSTRUCTURE AND PROPERTIES OF MICROALLOYED STEEL WELD METAL
N. A. Fleck, II Aug. 1984 140 p
(Contract N00014-83-K-0779; Proj. F61-541)
(AD-A149529; DTNSRDC/SME-CR-17-84) Avail: NTIS HC A07/MF A01 CSCL 11/9

Experimental submerged arc welds were made on quenched and tempered 3/4-in.-thick C-Mn-Mo-Nb plate using various combinations of filler wires and fluxes. The welds were made under conditions of constant heat input (75 kJ/in) and a constant deposition ratio of wire speed to travel speed of 13. Standard quantitative metallographic techniques were used to evaluate the volume fraction of the weld metal microconstituents, the acicular ferrite lath spacing, and the average prior austenite grain size. Along with hardness values, other weld metal properties were obtained from Charpy V-Notch specimens, Izod specimens, and tensile specimens. Results indicated that a commercial low SiO2, high CaF2 flux, combined with a filler wire microalloyed with titanium, boron, and molybdenum, provided the optimal microstructure in terms of weld metal properties. GRA

N85-19424# Department of the Air Force, Washington, D.C.
CONTACT INSERTION AND WIRE LAY ROBOTIC END EFFECTOR APPARATUS Patent Application
C. M. Travlos, inventor (to Air Force) Filed 16 May 1984 17 p
(AD-D011451; US-Patent-Appl-SN-610913) Avail: NTIS HC A02/MF A01 CSCL 13/9

This abstract describes insertion and wire lay apparatus for manufacture of wire harnesses which provides for insertion of a

contact affixed to the trailing end of a wire segment after wire lay. The invention provides for gripping a wire segment while the segment is caused to lay in a desired configuration. Thereafter, a set of tip jaws enables a trailing end contact to be inserted into a selected contact holding device. This operation may be prefaced, prior to wire lay, by insertion into another contact holding device of a contact affixed to the leading end of the wire segment, by means as another set of tip jaws. The apparatus is arranged to facilitiate lateral receipt and rejection of wire segments.
Author (GRA)

N85-19425# Department of the Army, Washington, D. C.
HOIST Patent Application
E. FGeppert, inventor (to Army) Filed 7 Dec. 1984 12 p
(AD-D011458; US-Patent-Appl-SN-679432) Avail: NTIS HC A02/MF A01 CSCL 13/3

A hoist is described that includes a winding drum for a load-lift cable mechanism. The drum has two drum sections of slightly different diameter; end portions of the cable are wound in different directions on the drum sections, so that one cable section winds onto a drum section while the other cable section winds off the other drum section. The effect is to provide a very slow net cable motion related to the difference in drum section diameters. The hoist includes a latch mechanism adapted to suspend the load from the boom during certain periods of a load transfer operation.
GRA

N85-19426# Department of the Army, Washington, D. C.
TIRE INFLATION/DEFLATION SYSTEM Patent Application
L. A. Gant, inventor (to Army) Filed 16 Nov. 1984 14 p
(AD-D011459; US-Patent-Appl-SN-672056) Avail: NTIS HC A02/MF A01 CSCL 13/6

An automatic tire inflation/deflation system is described for a vehicle with pneumatic tires. The system may be incorporated into existing vehicles without modification of the axles, wheels or tires. A pressure-responsive bellows is utilized at each wheel to open or close the existing tire valve in accordance with air pressure valves applied to the bellows exterior surface. A selector valve at the driver's station permits the human driver to remotely control the tire inflation or deflation process. During normal run operations, the air passage system is depressurized.
Author (GRA)

N85-19427# Department of the Army, Washington, D. C.
TIRE DEFLATION MECHANISM Patent Application
E. Kleemann, inventor (to Army) Filed 7 Nov. 1984 10 p
(AD-D011460; US-Patent-Appl-SN-669131) Avail: NTIS HC A02/MF A01 CSCL 13/6

A hand held mechanism is described that can be applied to a conventional tire inflation valve on a vehicle tire to facilitate a tire deflation operation. The mechanism includes a rod-like element that automatically engages a tire check valve to open said valve for tire venting purposes. The mechanism also includes a hollow tubular called wall structure adapted to receive the sensing head of a conventional pressure gage, whereby the progress of the tire-deflation operation can be ascertained, as necessary to properly terminate the operation at a desired tire pressure. Mechanisms of the described type can be utilized on all wheels of a multi-wheeled vehicle to permit simultaneously deflation of all vehicle tires, thereby greatly reducing the time required to achieve a total tire deflation operation.
Author (GRA)

N85-19428# Department of the Navy, Washington, D. C.
PRECISE BEARING SUPPORT DITHERER Patent Application
G. L. Assard and A. L. Moorcroft, inventors (to Navy) Filed 4 Jun. 1984 14 p
(AD-D011470; US-Patent-Appl-SN-617049) Avail: NTIS HC A02/MF A01 CSCL 13/9

The present invention relates to a device for improving the readout accuracy of precision measuring instruments and more particularly to a bearing support ditherer which acts to replace static bearing friction with the corresponding lower value of dynamic friction by selectively vibrating the bearing mount so as to produce a random or pseudo-random rotary planar motion of the bearing.
GRA

N85-19429# Allied Bendix Aerospace, Teterboro, N.J. Robotics Task Team.
NEW DEVELOPMENTS IN ROBOTICS: THE ROBOTS 8 CONFERENCE AND EXPOSITION
M. L. Furleigh, E. M. Lundgren, M. D. Clark, and J. R. Lembke Oct. 1984 35 p refs Conf. held in Detriot, 4 Jun. 1984
(Contract DE-AC04-76DP-00613)
(DE85-000263; BDX-613-3123; CONF-8406126-4) Avail: NTIS HC A03/MF A01

The Robots 8 Conference and Exposition was held in Detroit's Cobo Hall June 3 through June 7, 1984. This annual conference and exhibition provides a unique means of surveying the progress of nearly all the important vendors of robots and robot related equipment. The technical sessions present the results of research by man industrial and university groups and provide insight to the future directions of robotic development. The new developments, significant improvements, and changes of emphasis as they were perceived by members of the Bendix Kansas City Robotics Task Team who attended Robots 8 are highlighted. DOE

N85-19430# California Univ., Livermore. Lawrence Livermore Lab.
PERFORMANCE OF THE 10 KSI WILSON VALVE BREECH
Charles A. Honodel 15 Aug. 1984 17 p ref
(Contract W-7405-eng-48)
(DE85-000258; UCID-20148) Avail: NTIS HC A02/MF A01

A sliding valve was developed for use in a compressed helium breech for use on the LLNL 100 mm single stage gun tube. A new 10 KSI wraparound design incorporating the use of this Wilson sliding valve was tested and the results of some of those tests and a description of the breech operation are reported. DOE

N85-19431# Sandia Labs., Albuquerque, N. Mex.
ROBOTIC SAFETY
D. S. Kessel Oct. 1984 13 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002314; SAND-84-2019) Avail: NTIS HC A02/MF A01

The introduction of industrial robots in the workplace has improved safety by reducing human exposure to some of the traditional hazardous tasks and environments, yet at the same time robots have introduced new hazards in the workplace. There are currently no national consensus standards for robotic safety in the US. The hazards associated with industrial robots are provided. Safety guidelines to protect workers from these hazards are provided. In conclusion, it is the responsibility of manufacturers and users of industrial robots to develop and implement robotic safety guidelines for each application to ensure worker safety.
DOE

N85-19432# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF IMPLANTATION SPECIES ON THE TRIBOLOGICAL RESPONSE OF STAINLESS STEEL SURFACES
L. E. Pope, S. T. Picraux, D. M. Follstaedt, J. A. Knapp, and F. G. Yost 1984 23 p refs Presented at ASM Conf. on Coatings and Bimetallics for Energy Systems and Chem. Process Environ., Hilton Head Island, S. Car., 13 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-003530; SAND-84-1286C; CONF-841116-1) Avail: NTIS HC A02/MF A01

The friction and wear properties of 304 and 15-5 PH stainless steels which were ion implanted with P and with P plus C are examined and are compared with the properties of the same steels implanted with N and with Ti plus C. While benefits are obtained with the P and the P plus C implantation treatments, and the N and the Ti plus C treatments give greater reductions in wear which extend to more severe wear regimes; with Ti plus C, friction is also reduced. Transmission electron microscopy shows that the P and the P plus C implantations (with 20 to 30 at. percent metalloid concentrations) produce surface alloys with amorphous phases, as do Ti plus C treatments (approximately 20 at. percent each).

The greater benefits obtained with the Ti plus C amorphous phase imply that this phase is mechanically superior to the amorphous phase with P plus C, even though the latter was shown to have excellent mechanical properties when produced by melt quenching. Ti and C were selected for implantation into a 15-5 PH discriminator wheel of an electrochemical device for comparison with standard solid film lubrication (MoS2). DOE

N85-19433# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
ROBOTICS IN THE RADIOCHEMICAL LABORATORY
J. E. Young, S. D. Burkett, and W. A. Spencer 1984 10 p refs Presented at the 27th ORNL-DOE Conf. on Anal. Chem. in Energy Technol., Knoxville, Tenn., 2 Oct. 1984
(Contract DE-AC09-76SR-00001)
(DE85-002824; DP-MS-84-72; CONF-841023-3) Avail: NTIS HC A02/MF A01

Robotics technology provides tools for improved productivity and safety in the radiochemical laboratory. Several high volume analyses at the Savannah river Laboratory (SRL) have been targeted for the application of robotics. Some examples include the preparation of vials containing sample reagents, radioactive sample preparation, and quality control standard preparations. At SRL the Zymark components are used with devices which have been fabricated for our specific needs. These custom devices are described. DOE

N85-19434# SKF Industries, Inc., King of Prussia, Pa.
MECHANICAL INTERACTIONS OF ROUGH SURFACES Progress Report, 1 Jul. - 30 Sep. 1984
John I. McCool Sep. 1984 39 p ref
(Contract DE-AC02-84ER-13163)
(DE85-000814; DOE/ER-13163/4) Avail: NTIS HC A03/MF A01

This report is a Quarterly Report of Progress. The status of optical rig tests performed under fully flooded and starved conditions is summarized. Procedures for relating fringegram color and film thickness are described. A scheme is described for estimating the spectral moment by a modern profile measurement device. A computer program implementing the scheme and performing microcontact analysis is discussed and sample output is given. DOE

N85-19126# Joint Publications Research Service, Arlington, Va.
FRACTURE RESISTANCE OF SURFACE LAYER WITH TECHNOLOGICAL DEFECTS UNDER CYCLICAL LOADING
V. F. Lukyanov, V. V. Naprashnikov, and G. S. Vasilchenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 43 Transl. into ENGLISH from Svar. Proizvod. (Moscow), no. 6, Jun. 1984 p 3-5 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19130# Joint Publications Research Service, Arlington, Va.
DIFFUSION WELDING WITH FORCED DEFORMATION OF HEAT-RESISTANT NICKEL-BASED DISPERSION HARDENED ALLOY Abstract Only
E. S. Karakozov, A. P. Ternovskiy, T. S. Samsonova, E. V. Davidyan, S. S. Khayurov, and I. S. Polkin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 45-46 Transl. into ENGLISH from Svar. Proizvod. (Moscow), no. 6, Jun. 1984 p 15-17 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19131# Joint Publications Research Service, Arlington, Va.
COMPUTATION OF THERMAL SHOCK-FREE STRAIGHTENING CONDITIONS FOR ALUMINUM-MAGNESIUM ALLOY WELDED STRUCTURES Abstract Only
V. M. Kaikin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 47 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 6, Jun. 1984 p 62-66 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19132# Joint Publications Research Service, Arlington, Va.
ROLE OF HYDROGEN IN PROCESSES OF DEFORMATION AND FRACTURE OF METALS Abstract Only
S. I. Mikitishin *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 63-64 Transl. into ENGLISH from Fiz.-Khim. Mekh. Mater. (Kiev), v. 20, no. 3, May - Jun. 1984 p 23-26 Original language doc. was announced in IAA as A84-41791 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19202# Joint Publications Research Service, Arlington, Va.
NATIONAL MACHINE TOOLS CONFERENCE SLATED FOR 1985: CONFERENCE AGENDA, PAPERS
L. T. Wrotny *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-85-008) 15 Feb. 1985 p 20-39 refs Transl. into ENGLISH from Mech. (Warsaw), no. 6, 1984 p 286 (For primary document see N85-19200 10-31)
Avail: NTIS HC A04/MF A01

N85-19212# Joint Publications Research Service, Arlington, Va.
ARMENIA MARKETS NEW DRIVE MOTORS FOR MACHINE TOOLS
K. Firsov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 4-5 Transl. into ENGLISH from Kom. (USSR), 9 Sep. 1984 p 2 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

N85-19213# Joint Publications Research Service, Arlington, Va.
DEAN OF KIEV STATE UNIVERSITY ON IMPACT OF ROBOTS
I. I. Lyashko *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 6-11 Transl. into ENGLISH from Pod Znamenem Leninizma (Kiev), no. 16, Aug. 1984 p 67-69 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

N85-19214# Joint Publications Research Service, Arlington, Va.
PRODUCTION TURRET LATHE RETROFITTED WITH ROBOT
V. A. Petrov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 17-21 Transl. into ENGLISH from Stroit. Dor. Mashiny (Moscow), no. 7, Jul. 1984 p 7-9 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

N85-19215# Joint Publications Research Service, Arlington, Va.
SPECIFICATIONS, APPLICATIONS OF GANTRY ROBOTS VIEWED
V. I. Tsarenko, V. A. Popov, V. P. Sobolev, and P. I. OVchimnikov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 22-30 Transl. into ENGLISH from Mekhan. (Moscow), no. 7, Jul. 1984 p 4-6 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

N85-19216# Joint Publications Research Service, Arlington, Va.
ROBOTIZED BLANKS LOADER FOR NEW FORGE PRESS
In its USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 31 Transl. into ENGLISH from Leningr. Pravda (Leningrad), 21 Sep. 1984 p 1 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

N85-19217# Joint Publications Research Service, Arlington, Va.
FLEXIBLE APPLICATIONS ROBOT USED IN MOSCOW TRAINING COURSE
L. Selyunina *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 32-33 Transl. into ENGLISH from Sots. Ind. (Moscow), 1 Sep. 1984 p 3 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

N85-19237*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANTENNA AXIS DRIVE TORQUES FOR THE 70-METER ANTENNA

H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 121-126 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

N85-19238*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN EVALUATION OF THE 64-METER ANTENNA RADIAL BEARING FOR USE ON THE 70-METER ANTENNA
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 127-141 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

N85-19239*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELEVATION BEARING MAXIMUM LOAD, 70-METER ANTENNA
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 142-145 ref (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

N85-19240*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CHARACTERISTICS OF THE ELEVATION DRIVE SUSPENSION OF THE 64-METER ANTENNAS
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 146-175 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

N85-19241*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HYDROSTATIC BEARING PAD MAXIMUM LOAD AND OVERTURNING CONDITIONS FOR THE 70-METER ANTENNA
H. D. McGinness *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 176-179 ref (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-19435# Army Armament Research and Development Command, Dover, N. J. Product Assurance Directorate.
ULTRASONIC INSPECTION OF ALLOYED TUNGSTEN BARS Final Technical Report
H. Hartmann Nov. 1984 20 p
(AD-A148900; AD-E401258; ARPAD-TR-84007) Avail: NTIS HC A02/MF A01 CSCL 14/2

Alloyed tungsten bars made from powdered metals that are compressed, sintered, and swagged can be ultrasonically inspected. Both longitudinal and shear waves were used, the latter being more sensitive. A frequency of 2.25 MHz proved best. One crack was found. The crack was equated to a standard. GRA

N85-19436# NDT Technologies, Inc., South Windsor, Conn.
ELECTROMAGNETIC INSPECTION OF WIRE ROPES USING SENSOR ARRAYS Annual Summary Report, 16 Jun. 1983 - 15 Jun. 1984
H. R. Weischedel 5 Nov. 1984 61 p
(Contract N00014-83-C-0484)
(AD-A149016) Avail: NTIS HC A04/MF A01 CSCL 11/6

We developed a new quantitative procedure and instrumentation for the inspection of wire ropes. To gain a better understanding of the instrument performance, we undertook an experimental investigation of the magnetic flux patterns inside the instrument and wire rope. Using an IBM personnel computer in combination with appropriate interface hardware, we implemented computer aided defect identification methods. These methods are presently being improved and extended. We performed first experiments to implement methods for the inspection of wire rope end sections, close to the rope terminations. These experiments indicate that an instrument of this type is feasible. A prototype is presently being implemented. We delivered 12 small instruments of the new design to the US Navy. They are presently being successfully used by various Navy personnel. Additional instruments of the new design were sold to the Mine Safety and Health Administration, the Scripps Institute of Oceanography, the University of Rhode Island, the British National Coal Board, and the Kone Elevator Company. GRA

N85-19437# Army Tropic Test Center APO, Miami 34004.
NATURAL EXPOSURE VERSUS CHAMBER SIMULATION Methodology Investigation Data Report, Jan. 1983 - Aug. 1984
Sep. 1984 54 p
(AD-A149538; USATTC-840911) Avail: NTIS HC A04/MF A01 CSCL 14/2

This data report presents the results of the first phase of a methodology investigation intended to increase the validity of the environmental chamber testing of Army material. This phase involved field exposing material samples in selected natural tropic environments in the Republic of Panama and testing those samples to document changes which occurred as a result of that exposure. Subsequent phases will be conducted in environmental chambers at the Electronic Proving Ground, Fort Huachuca, Arizona, to attempt to duplicate those changes. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-19438*# Lehigh Univ., Bethlehem, Pa.
CRACK PROBLEMS FOR BONDED NONHOMOGENEOUS MATERIALS UNDER ANTIPLANE SHEAR LOADING
F. Erdogan Feb. 1985 20 p refs Prepared in cooperation with Fraunhofer Inst., Freiburg, West Germany
(Grant NGR-39-007-011)
(NASA-CR-172532; NAS 1.26:172532) Avail: NTIS HC A02/MF A01 CSCL 20K

The singular nature of the crack tip stress field in a nonhomogeneous medium having a shear modulus with a discontinuous derivative was investigated. The problem is considered for the simplest possible loading and geometry, namely the antiplane shear loading of two bonded half spaces in which the crack is perpendicular to the interface. It is shown that the square-root singularity of the crack tip stress field is unaffected by the discontinuity in the derivative of the shear modulus. The problem is solved for a finite crack and extensive results are given for the stress intensity factors. Author

N85-19439*# Lehigh Univ., Bethlehem, Pa.
INTERACTION BETWEEN A CRACK AND A SOFT INCLUSION
Liu Xue-Hui and F. Erdogan Feb. 1985 24 p refs
(Grant NGR-39-007-011; Contract DTRS56-82-C-00014)
(NASA-CR-172533; NAS 1.26:172533) Avail: NTIS HC A02/MF A01 CSCL 20K

With the application to weld defects in mind, the interaction problem between a planar-crack and a flat inclusion in an elastic solid is considered. The elastic inclusion is assumed to be sufficiently thin so that the thickness distribution of the stresses in the inclusion may be neglected. The problem is reduced to a system of four integral equations having Cauchy-type dominant kernels. The stress intensity factors are calculated and tabulated for various crack-inclusion geometries and the inclusion to matrix

modulus ratios, and for general homogeneous loadiong conditions away from the crack-inclusion region. Author

N85-19440# Yale Univ., New Haven, Conn. Dept. of Mechanical Engineering.
FINITE ELEMENT ANALYSIS OF NONLINEAR OSCILLATIONS AND FLUTTER OF SHELLS OF REVOLUTION Final Report, 16 Aug. 1982 - 15 Aug. 1983
Akhilesh Maewal 6 Apr. 1984 58 p
(Grant AF-AFOSR-0276-82; AF Proj. 2307)
(AD-A149071; AFOSR-84-1126TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

In chapter 1, a finite element methodology is described for analysis of steady nonlinear periodic oscillations of axisymmetric shells. The technique is a combination of asymptotic analysis and the finite element method and the results that it yields include the significant effect of nonlinear interaction between the waves that travel in opposite directions along the circumference. In chapter 2, an extended numerical method is described which is applicable to shells rotating at a constant speed about their geometrical axes. In the final chapter, a general solution for the problem of nonlinear flutter of axisymmetric shells is presented. The method is expected to be useful for developing a numerical scheme for analyzing this class of problems. GRA

N85-19441# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
FRACTURE TOUGHNESS OF FIBER REINFORCED CONCRETE Annual Report, 1 Jun. 1983 - 1 Nov. 1984
S. P. Shah 1 Nov. 1984 23 p
(Grant AF-AFOSR-0243-82)
(AD-A149403; AFOSR-84-1227TR) Avail: NTIS HC A02/MF A01 CSCL 11/2

The primary accomplishment during the reporting period was the development of nonlinear fracture criteria for cement-based composites. These fracture criteria accurately predict two important aspects of crack growth in concrete, fiber reinforced concrete and other cement-based composites: (1) nonlinear process zone; and (2) quasi-stable crack growth beyond the peak load. A preexisting crack in a concrete structure propagates in two stages: subcritical crack growth, and beyond the peak load-post critical crack growth. The second stage can be observed only if the structure is loaded in a displacement-controlled mode. As a result of nonlinear subcritical crack growth, when the fracture toughness of a concrete specimen (for example, notched-beam) is determined using conventional linear elastic fracture mechanics, different values are observed depending upon the size of the specimen. A size-independent critical stress intensity factor and critical crack-tip opening displacement are proposed as fracture toughness criteria for concrete. To evaluate these two parameters, nonlinear deformations must be extracted from the total displacement. How to evaluate these two parameters from the three-point notched beam test is detailed. Notched-beam specimens of three different sizes and five different materials composites were tested in a closed-loop testing system using the crack mouth opening displacement as a feed-back control. Crack growth was microscopically monitored. GRA

N85-19442# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
STRESS CONCENTRATION DUE TO AXIAL TENSION OF LOADED NONSYMMETRIC-SHAPED GROOVES Final Technical Report
Y. F. Cheng Nov. 1984 33 p Presented at 5th Intern. Congr., Exptn. Mech., Montreal, 10-15 Jun. 1984
(AD-A149425; AD-E440266; ARLCB-TR-84037) Avail: NTIS HC A03/MF A01 CSCL 20/11

Lug and groove connections are frequently found in structures where two components meet and loads are transmitted. These grooves usually have a nonsymmetric shape, i.e., the flank angle at the loaded face is different from that at the free face. While numerous data on stress concentrations for symmetric-shaped grooves (for example, U- or V-shaped) are available, very little information exists for nonsymmetric-shaped grooves. This report describes a photoelastic study on stress concentration in plates due to axial tension of loaded nonsymmetric-shaped grooves. Groove geometries as well as loading conditions are given. Maximum groove stresses were found and stress concentration factors were calculated. Also, parametric curves of stress concentration were obtained. A comparison was made between experimental results and those calculated by means of Heywood's equation. GRA

N85-19443# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Technology.
MECHANISMS OF DAMAGE ACCUMULATION IN TIME-DEPENDENT CYCLIC DEFORMATION Final Progress Report, 1 Jan. - 31 Dec. 1984
Campbell Laird and John L. Bassani Aug. 1984 32 p refs
(Contract DE-AC02-80ER-10570)
(DE85-001004; DOE/ER-10570/3) Avail: NTIS HC A03/MF A01

The damage phenomena in machines used for energy conversion and storage was investigated. A quadratic programming procedure was developed for the calculation of single crystal plastic response, and the results previously reported on cyclic response can be used to develop realistic predictions of polycrystalline failure behavior. Damage in Cr-Mo-V steel at various elevated emperatures was assessed for regular cycling and cycling with holds. Damage takes several forms of which two of the most important are cavitation and accelerated (> X100) secondary hardening, which has the effect of depleting the matrix of Mo and therby including embrittlement. DOE

N85-19444# Argonne National Lab., Ill.
FLUIDELASTIC INSTABILITY IN SHELL AND TUBE HEAT EXCHANGERS: A FRAMEWORK FOR A PREDICTION METHOD
M. W. Wambsganss, C. I. Yang, and H. Halle 1984 16 p refs Presented at ASME Winter ann. Meeting, New Orleans, 9 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-006518; CONF-841201-1) Avail: NTIS HC A02/MF A01

A framework for a method to predict fluidelastic instability in heat exchanger tube bundles is presented. The method relies on a computer code to obtain a simulation of the three-dimensional flow distribution within the heat exchanger. Local crossflow velocities corresponding to each tube in the exchanger are obtained by interpolation and resultant crossflow velocity distributions are computed. With a knowledge of the vibration mode shapes and frequencies, reduced effective crossflow velocities are then computed for each tube. The tubes with highest values of predicted reduced effective crossflow velocity are expected to be the first to experience fluideleastic instability. DOE

N85-19445*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
SIMPLE HIGHER-ORDER THEORY FOR LAMINATED COMPOSITE PLATES
J. N. Reddy Mar. 1984 30 p refs Submitted for publication
(Grant NAG1-459)
(NASA-CR-174421; NAS 1.26:174421; PB85-118966;
VPI-E-83-28) Avail: NTIS HC A03/MF A01 CSCL 20K

A higher-order shear deformation theory of laminated composite plates is developed. The theory contains the same dependent unknowns as in the first-order shear deformation theory of Whitney and Pagano but accounts for parabolic distribution of the transverse shear strains through the thickness of the plate. Exact closed-form solutions of symmetric cross-ply laminates are obtained and the results are compared with 3-D elasticity solutions and first-order shear deformation theory solutions. The present theory predicts the deflections and stresses more accurately when compared to the first-order theory. GRA

N85-19127# Joint Publications Research Service, Arlington, Va.
FATIGUE RESISTANCE OF WELDED JOINTS OF HIGH STRENGTH STEELS PRODUCED BY ELECTRON BEAM WEL-

DING Abstract Only
V. I. Zagornikov and S. N. Kovbasenko *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-008) 20 Dec. 1984 p 44 Transl. into ENGLISH from Svar. Proizvod. (Moscow), no. 6, Jun. 1984 p 25 (For primary document see N85-19088 10-26)
Avail: NTIS HC A04

N85-19203# Joint Publications Research Service, Arlington, Va.
METHODOLOGY FOR STRESS ANALYSIS OF HEAVY METAL PLATE
Marian Kmiecik and Alfred Jazukiewicz *In its* East Europe Rept.: Sci and Technol. (JPRS-ESA-85-008) 15 Feb. 1985 p 40-46 refs Repr. from Budownictwo Okretowe (Warsaw), no. 10, 1984 p 4-5, 407 (For primary document see N85-19200 10-31)
Avail: NTIS HC A04/MF A01

42 GEOSCIENCES (GENERAL)

N85-19446# Joint Publications Research Service, Arlington, Va.
USSR REPORT: EARTH SCIENCES Abstracts Only
11 Feb. 1985 59 p refs Transl. into ENGLISH of various Russian articles
(JPRS-UES-85-003) Avail: NTIS HC A04/MF A01

Research on arctic and antarctic regions, meteorology, oceanography, atmospheric physics, and terrestrial geophysics is discussed. Seismology, geomagnetism, ectonics, auroras, glaciers, gravitation, and climate are among the topics considered. For individual titles, see N85-19447 through N85-19483.

N85-19447# Joint Publications Research Service, Arlington, Va.
SPATIAL DISTRIBUTION OF AURORAS AND ITS RELATIONSHIP TO GEOLOGICAL STRUCTURE OF NORILSK REGION Abstract Only **c46**
Yu. K. Krakovetsky, L. N. Popov, I. P. Doronina, and L. M. Chagarov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 7 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 8, Aug. 1984 p 18-23 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

A study was made of the interrelationship of spatial distribution of auroras and geological structure in the Norilsk region. The spatial distribution of auroras was constructed based on materials obtained with the S-180 camera at Norilsk Observatory. The geological structure of the Norilsk region was analyzed within the limits encompassed by the photographs. Each of the structural zones is named and briefly described. It was found that regions of minimum probability of appearance of auroras corresponded with certain geological formations. An example is a minimum with a probability of 0.023 corresponding to the Evetkinskiy paleovolcano. Isolines with $p = 0.023$ and $p = 0.019$ encompass the Keta-Irbinskiy and Unoganskiy paleovolcanoes on the northwestern shore of Keta Island. The absence of any relationship of probability of appearance of auroras to local magnetic anomalies caused by differentiated intrusions of gabbrodolerites or deposits of sulfide copper-nickel ores or magnetite ores and the seeming correlation of maxima with geological formations having very weak magnetization may result from deep basement structures. A study of this possibility is planned. R.J.F.

N85-19448# Joint Publications Research Service, Arlington, Va.
DECADE OF THE VARILOV KUPOLA Abstract Only **c46**
L. S. Govorukha *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 7-8 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow), no. 5, Sep. - Oct. 1984 p 79-82 (For primary document see N85-19446 10-42)
Avail: NTIS HC A4/MF A01

Vavilov Kupola is a glaciological station operated by the Arctic and Antarctic Scientific Research Institute since 1974. It is located atop a dome shaped glacier on an island in the Severnava Zemlva archipelago. The station is 700 m above sea level, forcing scientists who work there to live almost constantly in the clouds. Continuous scientific studies at the station over the past 10 years involved a eries of glaciological, meteorological and actimetric observations, information on the amplitude of the variability of snow accumulation from year to year, accumulation and ablation of glaciers, as well as air temperatures. Radar studies are used to determine internal structure and thickness of the Vavilov Glacier. R.J.F.

N85-19449# Joint Publications Research Service, Arlington, Va.
ATLAS OF SNOW AND ICE RESOURCES Abstract Only **c43**
In its USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 9 refs Transl. into ENGLISH from Tass (Tallinn, USSR), 29 May 1984 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Compilation was completed of an atlas of the world's snow and ice resources. It will help to determine the influence of ice on the Earth's climate. Climatic patterns of individual mountain glacier areas specifically came to light. It is expected, for example, that the limit of mountain agriculture in the Greater Caucasus will rise at the beginning of the 21st century to 300 meters or more. Interest increased in evaluating water resources in connection with the increase in industrial and agricultural use of water. It was established, that the summer thaw of sea ice in the Arctic basin alone causes the formation of four times the amount of fresh water in the total annual flow of such giant rivers as the Yenisey, Ob, Lena in Siberia and the Mackenzie in Canada. At the same time an acceleration of thawing of polar ice, which threatens undesirable climatic consequences, due to a reduction in its reflectivity as a result of a drift of dust and soot to the Arctic, was caused by the unchecked activity of enterprises of certain countries in the region. R.J.F.

N85-19450# Joint Publications Research Service, Arlington, Va.
MAJOR GLACIATION EVENTS OF THE PAST AND THEIR GEOLOGICAL SIGNIFICANCE Abstract Only **c46**
N. M. Chumakov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 10 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geol. (Moscow), no. 7, Jul. 1984 p 35-53 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The sequence, spatial and time scales of the major glaciation events, the paleoclimatic environment and their significance in geological history are discussed. Ancient glaciations were concentrated in four or five long intervals of geological history: the late Cenozoic, the middle to late Paleozoic, the late Riphean and the early Proterozoic. These glacial intervals show signs of repeated glaciations and lasted from 30 to 300 million years each. They are separated by periods of time varying from 120 million to 1400 million years during which glaciation was not observed. World climatic maps are presented for 9 different stages of geological history. The asymmetry of glaciation is noted: with polar or subpolar location of the continent in one of the hemispheres, cooling and glaciation in the hemisphere occupy significantly greater areas. Glaciations and accompanying events represented a significant portion of the post-Archean history of the Earth and also strongly influenced many geological and biological processes. R.J.F.

N85-19451# Joint Publications Research Service, Arlington, Va.
EVOLUTION OF SEDIMENTATION BASINS IN EARTH'S HISTORY Abstract Only **c46**
P. P. Timofeyev and V. N. Kholodov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 19 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geol. (Moscow), no. 7, Jul. 1984 p 10-34 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The data presented indicate a certain directionality in the development of types of sedimentary processes over time, with an increase in the degree of contrast of the relief of the planet. From the Archean to Quaternary the differences between levels of upthrusts and depressions continually increase, the height of mountain ridges and of the continents increases, trench morphometry of the seas and oceans increases, the volume of

sea water and ocean water increases, particularly in Postpaleozoic time. Quite similar shallow water sediment accumulation conditions were observed in the Jurassic and Cretaceous periods both in contemporary oceanic basins and over a portion of the contemporary continental block. At the end of the late Cretaceous and beginning of the Paleogenic period, as a result of separation and depression of tremendous areas of America, Eurasia, Africa and Australia, the contemporary ocean began to develop. This event was observed in boreholes as the broad scale occurrence of deep water red clays. The deepening of the ocean depressions which occurred in the Cenozoic completed the stabilization period and led to the development of actual oceanic sedimentation. R.J.F.

N85-19452# Joint Publications Research Service, Arlington, Va.
TYPES OF PLACER FORMATION OF EASTERN ARCTIC SHELF Abstract Only **c46**
Yu. P. Bezrodnykh *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 20 Transl. into ENGLISH from Soverskaya Geol. (Moscow), no. 9, Sep. 1984 p 33-37 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The conditions existing near protrusions of the bedrock basement on the Cenozoic eastern Arctic shelf facilitate the concentration of metal bearing minerals of variable granular composition and the formation of multilayer, polyfacial placers of great thickness. The unique morphology, genesis, and composition of such metal bearing deposits is most characteristic for tin placers. A significantly greater fraction of the metal of crustal sources accumulates here than in river valleys. Changes in sedimentation conditions as a result of fluctuations of sea level in Cenozoic time caused close placement and joining of deposits of alluvial and littoral marine deposits of different ages. Placers of this type are also polygenetic varieties, though their productive deposits vary in genetic type and age in the lateral direction within the limits of the basal horizon. It is important for quantitative prediction to determine the coefficients which relate reserves of metal in placer and crustal sources for the various morphostructures of the boundary zone. Author

N85-19453# Joint Publications Research Service, Arlington, Va.
CALCULATION OF OPTICAL CHARACTERISTICS OF SHELF ECOLOGICAL SYSTEM BASED ON ITS MATHEMATICAL MODEL Abstract Only **c45**
V. I. Belyayev and M. G. Poplavskaya *In its* USSR Rep: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 21 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 6, Aug. 1984 p 1345-1347 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The annual course of concentrations of wet phytoplankton mass and the equivalent biomass of nonliving organic matter obtained in an earlier work were used to calculate the spectral functions beta(lambda), kappa(lambda), and R(lambda) where lambda is 400 to 700 mm of a shelf ecological system. Seasonal differences in the kappa(lambda) spectra result from changes in the content of dissolved and suspended organic matter. The annual course of kappa(lambda) has three maxima, the first resulting from a high content of pigments characteristic for the spring bloom, the second resulting from a high concentration of yellow matter, and the third corresponding to the autumn season. Author

N85-19454# Joint Publications Research Service, Arlington, Va.
INTRUSION OF RADIOACTIVE INDUSTRIALLY POLLUTED WATER FROM NORTH SEA INTO CENTRAL BALTIC SEA Abstract Only **c45**
S. M. Vakulovskiy and A. I. Nikitin *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 21 Transl. into ENGLISH from At. Energ. (Moscow), no. 3, Sep. 1984 p 186-188 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

In order to study the problem of penetration of radioactive industrially polluted water into the central Baltic Sea. The content of Cs-134 as determined in water near the bottom of deep water trenches along the path traveled by North Sea water entering the Baltic. Samples were taken at 5 locations, with Cs-134 concentrated from samples of several thousands of liters. It was found that radioactive pollution caused by the entry of water from the North Sea extends through the system of deep water depressions into the Baltic as far as the Gotland trench. The greatest degree of contamination is found in the Arkona depression adjacent to the straits. The concentration of Cs-134 in the Gdansk trench is one-half as great and in the Gotland trench one-third as great as in the Arkona depression. Radioactive contamination in the Baltic is attributed to discharge of radioactive wastes by plants at Windscale. Author

N85-19455# Joint Publications Research Service, Arlington, Va.
SILVER METALLOGENY IN EARTH'S PACIFIC OCEAN SEGMENT Abstract Only **c43**
A. D. Shcheglov, V. G. Khomich, and I. N. Govorov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 22 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk, USSR), no. 4, Jul. - Aug. 1984 p 3-14 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Within the Pacific Ocean there are various orders of zonality in the location of silver and silver-bearing deposits. Maps and scales are presented outlining this zonality in the magmatic rocks of various Pacific Ocean structures and the location of major silver belts and zones in and around the Pacific, along the western coast of North and Central America, and in Japan. Silver forms both large independent and complex ore formations of varying age around the Pacific. Industrial concentrations of silver are frequently associated with gold and polymetals. There is a clear relationship between silver and tin, manganese, potassium, and less frequently fluorine in the Pacific area. Silver in independent concentration is found in younger ore formations from the Cretaceous, Paleogenic, and Neogenic times, for which it is characteristically associated with volcanic continental formations on hard consolidated substrates of various ages and types of structures. Author

N85-19456# Joint Publications Research Service, Arlington, Va.
NEW DATA ON STRUCTURE OF SHIRSHOV RIDGE (BERING SEA) Abstract Only **c46**
Yu. P. Neprochnov, V. V. Sedov, L. R. Merklin, and G. B. Rudnik *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 22-23 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 6, Aug. 1984 p 1459-1463 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The Shirshov Ridge which separates the Bering Sea into the Aleutian and Komandorskiy Basins was studied from sonar soundings, continuous seismic profiling, magnetometry, deep seismic soundings, dredging and underwater photography, geological-geochemical work, and geothermal measurements. Data were obtained on the structure of the Earth's crust beneath Shirshov Ridge. The thickness of the crust in the northern portion of the ridge was found to be about 18 km. Shirshov Ridge is thus primarily formed of imbricate thrusts of the crust of the Aleutian Basin caused by great horizontal compression. The crustal rocks of the ridge consist of three associations. The first two associations can be considered part of the ancient ocean crust brought to the surface upon tectonic movement due to the influence of horizontal compression in the early stages of ridge formation. Author

N85-19457# Joint Publications Research Service, Arlington, Va.
BEHAVIOR OF MODE FREQUENCY CHARACTERISTICS IN SHALLOW SEA WITH VARIATION OF P-WAVE VEOCITY IN BOTTOM SEDIMENT LAYER AND SONIC VELOCITY PROFILE IN WATER LAYER Abstract Only **c71**
N. S. Ageyeva and V. D. Krupin *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 22 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 577-584 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The changes in modal frequency characteristics were analyzed

in a shallow sea upon variation of longitudinal wave velocity in the sedimentary layer of the bottom and the profile of the speed of sound in the water layer. The thickness of the water layer was assumed to be 65 m, and the thickness of the sediment layer on the bottom was assumed to be 60 m. The characteristics of modes in a shallow sea with a stratified absorbing bottom were found to differ quite basically as a function of whether the speed of sound in the bottom sediment was greater or less than the minimum speed of sound in the water. Since the distribution of attenuation coefficients by mode numbers is complex and irregular, greater caution must be taken in limiting the mode numbers in calculating a summary sound field. Author

N85-19458# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF BRAGG REFLECTING LATTICE GROOVE DEPTH MODULATION ON RAYLEIGH WAVE REFLECTION COEFFICIENT Abstract Only **c71**
Yu. Yu. Alyakna, Yu. V. Gulyayev, A. L. Kozlov, and V. P. Flesskiy *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 24 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 585-588 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

A method is suggested for calculating the characteristics of modulated reflecting lattices. Characteristics are calculated for a number of specific cases. Special selection of the weighting function can significantly reduce the degree of reflection of waves outside the Bragg band while retaining a near unity coefficient of reflection at the central Bragg frequency. Author

N85-19459# Joint Publications Research Service, Arlington, Va.
PRELIMINARY RESULTS OF STUDY OF SPACE-TIME VARIABILITY OF SHALLOW SEA ON STEADY ACOUSTICAL PATH Abstract Only **c71**
F. V. Bunkin, A. V. Vavilin, V. A. Zhuravlev, Yu. A. Kravtsov, A. Yu. Lyubchenko, N. N. Omelchenko, V. G. Petnikov, L. T. Kudiyev, and A. Yu. Shmelev *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 24 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 594-598 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

A steady acoustical path was organized in a shallow sea. The depth of the sea along the path was a few hundred meters. The radiating system consisted of two electromagnetic sources with a resonant frequency of a few hundred hertz. Two audio frequency signals were emitted simultaneously in bursts of about 1200 seconds separated by pauses of 20 seconds. The apparatus used was able to maintain signal phase from pulse to pulse. Variations were found in the phase of the leading edge of the sound wave in the horizontal plane by up to 0.5 deg. The signal envelop was found to contain components with periods of 6, 8, 12, and 24 hours plus many spectral components with periods of a few minutes to a few hours. Acoustical soundings over a steady path thus revealed the characteristic time and space scales of variation of the acoustical field in a shallow sea. Author

N85-19460# Joint Publications Research Service, Arlington, Va.
SPECIFICS OF BACKSCATTERING OF SOUND BY BOTTOM OF BANK IN OPEN SEA Abstract Only **c71**
A. V. Bunchuk, Yu. Yu. Zhutkovskiy, and Yu. P. Lysanov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 25 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 599-604 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Measurements of the angular and frequency variation of backscattering coefficients of sound by the bottom of a bank were performed independently by a pulse method and a tone-pulse method. The pulse method utilized surface explosions of 200 g charges; the second method utilized a special deep-water receiving system operating in the tone-pulse mode with a pulse length setting of several ms, carrier frequency 5 KHz. The sound receiver and source were both nondirectional. Analysis of the results indicated that the bottom of the bank was a hard base, for example, cooled lava from an underwater volcano, covered by a layer of loose sediment a few meters thick. The experiments confirmed that the structure of the bottom sediments is important, in this case decisive, in the process of backscattering of sound by the bottom. Author

N85-19461# Joint Publications Research Service, Arlington, Va.
AVERAGE SOUND INTENSITY DECREASE RULE IN IRREGULAR HYDROACOUSTICAL WAVEGUIDE Abstract Only **c71**
B. G. Katsnelson and L. G. Kulapin *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 25 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 643-648 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The change of average intensity with distance in irregular sound channels in which the rays experience multiple reflections from an absorbing surface was investigated. This is the case in a shallow sea with depth variable over its length in a sound channel which conforms to the bottom or surface. Analytic expressions are obtained for the intensity of the sonic field as a function of distance traveled through the channel, and the results are compared with calculations based on summation of modes. B.W.

N85-19462# Joint Publications Research Service, Arlington, Va.
PROCESSING OF UNDERWATER PHOTOGRAPHS Abstract Only **c35**
Ye. A. Melina *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 26 Transl. into ENGLISH from Geod. I Kartografiya (Moscow), no. 8, Aug. 1984 p 44-46 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Underwater stereophotogrammetric survey photographs generally include no reference points and insufficient numbers of control points, preventing the use of rigorous photogrammetric processing methods. The specifics of underwater stereosurveying require some changes in methods for processing pairs of photographs. Special coordinates are determined by direct photogrammetric intersection by an analytic method involving a computer. The major stages in analytic processing of photographs include measurement of coordinates of points on the stero pairs, transformation of measured coordinates to a base coordinate system by known equations, reducing the coordinates of the points on the pair, computation of photogrammetric coordinates of object points by equations presented in the article and determination of distance between the points. The method is intended for determination of quantitative charactersitics of biological objects in oceanographic studies and can be used to study the microrelief of the sea bottom. B.W.

N85-19463# Joint Publications Research Service, Arlington, Va.
ALUMINUM IN BIOGENIC CYCLE AND FORMS OF ITS OCCURENCE IN OCEAN Abstract Only **c43**
L. L. Demina, A. P. Lisitsyn, and V. N. Lukashin *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 26-27 Transl. into ENGLISH from Izv. Akad. Nauk SSSR., Ser. Geol. (Moscow), no. 9, Sep. 1984 p 79-84 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Specimens of surface suspension and bottom sediments were repeatedly chemically leached to yield information on forms of aluminum in the ocean. The quantity of aluminum utilized by plankton in the photic zone is more than double the receipts of aluminum into the ocean dissolved in river runoff. Aluminum must thus pass through the biological cycle at least twice per year. Marine organisms concentrate A1 from sea water by a factor of 100 to 100,00. Significant quantities of aluminum are included in the organic fraction in sea water. A1 is clearly not a terrigenous component of the ocean, brought in by river and atmospheric suspension. A portion of it passes through the biological cycle and is converted to organomineral forms, entering the sediment as colloidal forms which are gradually decrystallized. The use of aluminum in sediment as an indicator of lithogenic material is reliable only in lithogenic sediments. In typical pelagic sediment

the terrigenous A1 matrix method is inadequate, as it is for oceanic suspensions. B.W.

N85-19464# Joint Publications Research Service, Arlington, Va.
ORGANOGENIC STRUCTURES (SUBMERGED REEFS) IN SILHETIAN LIMESTONE OF WEST BENGAL BASIN Abstract Only **c46**
V. A. Moskvich *In its* USSR Rept: Earth Sci. (JPS-UES-85-003) 11 Feb. 1985 p 27 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geol. (Moscow), no. 9, Sep. 1984 p 102-109 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Organogenic structures of the Silhetian suite of the western Bengal petroleum basin were studied based on materials from deep drilling, seismic prospecting by the common depth point method and geological surveying. Geophysical data from deep holes were correlated with paleontological data, including paleopalinological data and geophysical findings concerning the lithologic characteristics of sections, as well as geological survey material, in order to correlate the Eocene deposits. The structure of the Eocene deposits is described and schematically diagrammed. The basic reef formers are red algae, less frequently bnyozoans. Collectors were primarily developed in organogenic structures consisting of bnyozoans which later underwent intensive secondary dolomitization. The propagation of the organogenic structures was controlled by cosedimentation tectonic movements related to the development of the Calcutta-Mymensingh zone of the lateral bench. This was developed in the Eocene as a transitional band between an uncompensated depression in the east and a stable area of compensated sediment accumulation in the west of the basin. B.W.

N85-19465# Joint Publications Research Service, Arlington, Va.
LASER AIR POLLUTION MONITORING SYSTEM PLANNED FOR MOSCOW Abstract Only **c45**
In its USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 28-29 Transl. into ENGLISH from Moskovskaya Pravda (Moscow), 1 Dec. 1984 p 3 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

A scheme for setting up a comprehensive system of laser posts which would keep track of the purity of Moscow's air is discussed. The concentration of pollutants in the air is determined according to the brightness of emitted and reflected laser beams. The data of each laser shot are shown quickly in the form of control numbers on screens of instruments. Units of this type can determine the condition of the atmosphere according to the most varied parameters. The institute's scientists have tested lasers which are capable of reacting sensitively to the presence in air of ozone, ammonia, sulfur dioxide, and nitrogen oxides. Stand and field tests have been conducted with this apparatus. B.W.

N85-19466# Joint Publications Research Service, Arlington, Va.
DISCOVERY ABOUT TEMPERATURE FLUCTUATIONS IN TURBULENT AIR FLOWS Abstract Only **c34**
In its USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 30 Transl. into ENGLISH from Vechernyaya Mosk. (Moscow), 19 Oct. 1984 p 2 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The law of spatial fluctuations of temperature in a turbulent flow in the atmosphere was studied. The turbulent movement of air in the atmosphere manifests itself in random changes in wind velocity and in the dispersal of smoke. If a miniature thermometer with sufficient sensitivity and speed of response were placed in a air flow, its readings would fluctuate chaotically against the background of average temperature. This is Characteristic of practically every point of the flow. The temperature field forms as a result of the mixing of the air. A method using the relation of the mean square of the difference in temperatures of two points to the distance between these points as the structural characteristic of this field was proposed. It was found that the dissipation of energy in a flow and the equalization of temperatures are connected with the breaking up of eddies in a turbulent flow into smaller ones. Their energy in turn is converted into heat due to the viscosity of the medium. The law that has been discovered makes for a much broader field of application of physical methods of analyzing atmospheric phenomena. B.W.

N85-19467# Joint Publications Research Service, Arlington, Va.
STUDY OF LOWER IONOSPHERE BY PULSE CROSS-MODULATION METHOD Abstract Only **c46**
L. F. Chernogor *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 31 Transl. into ENGLISH from Geofiz. Zh. (Kiev), v. 6, no. 5, Sep. - Oct. 1984 p 46-58 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Three installations in the U.S.S.R. use cross-modulation to study the lower ionosphere from the Earth. Soviet work developed in the following directions: (1) simultaneous use of a number of independent methods; (2) use of broadband apparatus operating in the 1 to 6 MHz band; (3) utilization of both stationary and mobile installations; and (4) utilization of high powers (10 to 100 MW per pulse). Theoretical principle, as well as measurement and processing methods are described. Possibilities and errors of the method are considered. Information on the lower portion of the ionosphere, including the C layer can be collected in the daytime as well as the base of the ionosphere at 75 km at night. A better method for systematic studies of the D region is the partial reflections method. Author

N85-19468# Joint Publications Research Service, Arlington, Va.
CONDENSATIONAL TRANSFORMATION OF ATMOSPHERIC AEROSOL PARTICLE DISTRIBUTION FUNCTIONS Abstract Only **c46**
A. G. Laktionov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 31-32 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 6, Aug. 1984 p 1347-1350 Original language document was announced in IAA as A85-11578 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

A condensation model is developed which makes it possible to solve inverse problems of the determination of condensation-nuclei size distribution functions according to supersaturation on the basis of a known aerosol particle size distribution function. Also derived are formulas which make it possible to solve the direct problem of determining the particle size distribution functions for arbitrary relative humidity of the air on the basis of any known nuclei size distribution function according to supersaturation, as well as the inverse problem. The theoretical results are confirmed by experimental data obtained over the Atlantic Ocean, off the New Jersey coast. B.J. (IAA)

N85-19469# Joint Publications Research Service, Arlington, Va.
EARTHQUAKE-MODELING EXPERIMENT USING UNIQUE PRESS Abstract Only **c46**
G. Lamanov *In its* USSR Rept.: Earth ci. (JPRS-UES-85-003) 11 Feb. 1985 p 37 Transl. into ENGLISH from Sots. Industr. (Moscow), 25 Nov. 1984 p 4 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Stresses similar to those occurring at deep levels of the Earth are produced in specimens of rock with the aid of a press developed for laboratory use. Rock samples from earthquake zones of the USSR are being used in the experiment, as well as blocks made of artificial materials in which breakdown centers are created in advance. Elastic stresses which take decades or centuries to accumulate in the earth itself can be built up in 7-10 days by varying the loads on specimens in the press. Mini-earth-quakes produced by this method reportedly were forecast with 90 percent accuracy. Comparisons of data from the experiments with results obtained in natural earthquake forecasts indicate that precursor phenomena behave similarly in both laboratory and field condition. The modeling experiments show that there is a set of indicator-phenomena on whose basis a universal earthquake-forecasting method could be developed. Author

N85-19470# Joint Publications Research Service, Arlington, Va.
LOCALIZATION OF DESTRUCTION PROCESS Abstract Only **c46**

V. A. Mukhamedov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 38 Transl. into ENGLISH from Izv. Akad. Nauk Turkmensk. SSR, Ser. Fiz.-Tekhn., Khim. i Geol. Nauk (USSR), no. 2, 1984 p 30-35 (For primary document see N85-19446 10-42)

Avail: NTIS HC A04/MF A01

The focus of a tectonic earthquake is the site of a loss of continuity of rock caused by stresses accumulated due to shear deformations over a period of time. There is particular interest in study of the intermediate stage of the process, localization of fracture, i.e., drawing a system of fractures scattered over a large area into a narrow zone where one major fracture will form. A model of the formation of such an area of instability is presented and attempts are made to determine the necessary conditions for occurence of the process. The Pines theory of the growth of a single fracture by accumulation of vacancies under conditions of constant supersaturation is extended to a set of fractures with a constant concentration of vacancies. It is shown that a process of coalescence results which, if the boundaries of the fracture area are considered, results in localization of the destruction process. Author

N85-19471# Joint Publications Research Service, Arlington, Va.
VERTICAL MOVEMENTS AND STRUCTURE FORMATION WITHIN ISLAND SYSTEMS OF NORTHEAST ASIA Abstract Only **c46**

P. M. Sychev, V. K. Zakharov, and V. P. Semakin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 38-39 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 15-28 (For primary document see N85-19446 10-42)

Avail: NTIS HC A04/MF A01

The mechanism of magma movement is discussed and vertical movements of Kamchatka, Sakhalin and Japan are diagrammed and discussed. A comparison of deformations with gravitational anomalies shows that upward movements are accompanied by entry of masses into the crust, which is anomalous in structure, with current-conducting layers present at depths of 10 to 15 km. Magmatic activity in the region is manifested as gradual, discontinuous upward movement of magma melts with the formation jn the base of the crust and in the upper mantle of zones of partial melting. The end products of differentiation of the melts reach the upper portions of the cross section or the crust where the magma apparently crystallizes rapidly. Injection of melts at various levels is accompanied by hydrochemical interaction of the melts with the surrounding rock, causing deformation of overlying layers. Author

N85-19472# Joint Publications Research Service, Arlington, Va.
BASIC STRUCTURAL FEATURES AND PROBABLE MECHANISM OF FORMATION OF THE KURIL ISLAND SYSTEM Abstract Only **c46**

K. F. Sergeyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 39-40 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 29-40 (For primary document see N85-19446 10-42)

Avail: NTIS HC A04/MF A01

A dynamic model of the formation of the Kuril Island system is developed which explains all of its most important geomorphological, geological and geophysical peculiarities and is not contradicted by the results of theoretical and experimental studies of possible elastic bending of the lithosphere under the influence of the horizontal compressive load. The suggested mechanism of formation of island systems is essentially an alternative to the most popular current assumption of subduction of oceanic lithospheric plates beneath continental plates in the area of deep water trenches. The spreading of the oceanic lithosphere with time is a continuous process, while deformation of lithospheric plates is a periodic process. Deformations arise arise apparently when the compressive load exceeds the tensile strength of the lithosphere in areas of the greatest thickness gradient. Author

N85-19473# Joint Publications Research Service, Arlington, Va.
THERMAL CONDITIONS AND THINNING OF LITHOSPHERE IN LATE CENOZOIC IN SOUTHWESTERN US Abstract Only **c46**

Yu. A. Zorin, S. V. Lepina, and S. V. Lysak *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 40-41 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 49-59 (For primary document see N85-19446 10-42)

Avail: NTIS HC A04/MF A01

A two-dimensional summary model of the Basin and Range province, Colorado plateau and Rio Grande rift is discussed. The sequence of geological events in the Cenozoic is outlined. The model considers very rapid and slow introduction of the asthenosphere into the lithosphere and information on heat flow with geological data on the heat structure and the chronology of geological events. The model demonstrates that the surface of the asthenosphere appeared at its current depth beneath the Basin and Range province and beneath the Rio Grande rift no more than a few million years ago. The great dike was injected into the crust in the area of the Rio Grande rift equally recently. Beneath the Colorado plateau, the surface of the asthenosphere appeared at its present depth at least 30 million years ago. The crust in the Basin and Range province and Rio Grande rift is continuing to heat. Author

N85-19474# Joint Publications Research Service, Arlington, Va.
PROSPECTS AND MEANS FOR DEVELOPMENT OF THEORY AND PRACTICE OF INTERPRETATION OF GRAVITATIONAL AND MAGNETIC ANOMALIES Abstract Only **c46**

V. N. Strakhov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 41-42 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 60-70 (For primary document see N85-19446 10-42)

Avail: NTIS HC A04/MF A01

The development of gravimetric and magnetic prospecting depends at present on the development of systems and methodological, technical, mathematical, and geological-interpretation aspects. The major tasks in each of these fields are outlined and their significance indicated. The significance and specific importance of these aspects differ for various methods. The theory of interpretation of gravitational and magnetic anomalies is at present preparing to make a turn in the spiral of its development, involving revision of a number of classical means for extraction of information from gravitational and magnetic observations at a different methodological and analytic level. Means for revision of some of the classical means for extracting information are analyzed as they relate to the problem of field transformation. Author

N85-19475# Joint Publications Research Service, Arlington, Va.
RELATIONSHIP OF GOLD CONTENT TO GRAVITY FIELDS IN FAR EAST Abstract Only **c46**

L. V. Eyrish *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 42 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 94-98 (For primary document see N85-19446 10-42)

Avail: NTIS HC A04/MF A01

Gold content increases with depth in the Earth. Gravimetric materials can be used to divide territories into those which are and are not potentially gold bearing. Areas with regional gravity maxima are potentially gold bearing. Data from the Sikhote-Alin area on the relationship of gold content and the regional gravimetric fielkd confirm the idea of a relationship between gold ore formation and deep processes, the participation of mantle substance in ore formation and possible transformation of femic materials by granitoid magmas. Author

N85-19476# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODELING OF WAVE FIELDS BY SUPERIMPOSITION OF BOUNDARY WAVES IN REFLECTED EARTHQUAKE WAVES METHOD Abstract Only **c46**

M. N. Luneva *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 42-43 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 103-114 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The necessity of studying the kinematic and dynamic characteristics of these exchange waves excited by earthquakes waves, which carry information on structural specifies of seismogeological boundaries, increased interest in the method of mathematical modeling of wave fields, wave fields from complex boundaries based on the concepts of the theory of boundary waves. The method was used to develop an algorithm for computing wave fields of transmitted longitudinal and exchange waves in a two-layered medium with a cylindrical boundary of arbitrary shape. Theoretical seismograms are presented for various structures (fault, anticline, syncline, undulating boundaries). The model permits effective prediction of wave fields of transmitted longitudinal and exchange waves in the method of exchange waves excited by earthquakes for boundaries with plicative and disjunctive structure. Author

N85-19477# Joint Publications Research Service, Arlington, Va.
SOME SPECIFICS OF METHODS FOR MASS DETAILED STUDIES OF ROCK HEAT CONDUCTIVITY Abstract Only **c46**
Yu. A. Popov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 43 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Geol. i Razvedka (Moscow), no. 4, Apr. 1984 p 76-84 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Heat conductivity determinations using a mobile point heat source alloy mnassive thermophysical studies of rock under both laboratory and field conditions. The method allows detailed recording of heat conductivity distribution in specimens without requiring mechanical processing of a core and allows several hundred measurements to be performed in one day. The source used is not an ideal source such as that which forms the basis of the theoretical model. The specifics of the method related to this difference are discussed the depth of heat conductivity studies performed by the method estimated and recommendations for processing of information obtained using the method are presented. The depth of the method refers to the thickness of the rock layer heated by the point source. It is found to be possible to exclude the systematic error resulting from the differences between the actual energy source and the idealized source from the results in each case of measurement. The depth of the method is determined by the rate of movement of the source and temperature conductivity of the rock. Thermograms can be used for determination of equivalent heat conductivity of individual specimens and intervals in a borehole. Author

N85-19478# Joint Publications Research Service, Arlington, Va.
APPROXIMATION OF DIFFERENCE IN WATER TABLE POSITIONS BY HORIZONTAL STRATUM IN STUDIES OF THEIR INFLUENCE ON GRAVITY Abstract Only **c43**
M. K. Kurbanov and O. B. Kirsta *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 46 Transl. into ENGLISH from Izv. Akad. Nauk Turkmenskoy SSR, Ser. Fiz.-Tekhn., Khim. i Geol. Nauk (USSR), no. 2, 1984 p 65-71 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The possibility of representing the differences in positions of ground water level as a horizontal stratum in studies of the influence of differences in ground water level on the force of gravity at a number of points in the Ashkhabad geodynamic test area was studied. This area is located in the northern mountainous portion of central and eastern Kopet-Dag, its piedmont plain and the southern edge of the Kara Kum lowlands. In the interrelationship between water table depth and gravity, changes in water level were compared to corresponding variations in the gravitational field. Physical processing of the materials was performed by computer using standard programs. It is found to be sufficient in the studies to consider water level changes at distances not over 1 km from the gravimetric reference point. In most cases water level changes are uniform within the limits of this distance. For such points there is a linear relationship between water level and gravity allowing the horizontal stratum approximation to be used. Author

N85-19479# Joint Publications Research Service, Arlington, Va.
STUDY OF TECTONIC EARTHQUAKE PRECURSORS BY GEODETIC METHODS Abstract Only **c46**
V. M. Sigalov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 46-47 Transl. into ENGLISH from Geod. i Kartografiya (Moscow), no. 8, Aug. 1984 p 39-44 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Deformations of the Earth's surface which can be revealed by geodetic methods are among the most reliable earthquake precursors. A brief list is presented of geodetic leveling methods which have revealed the precursors of several earthquakes. To confirm the accuracy of determination of precursors of earthquakes based on the results of repeated leveling in epicenter zones and observations at Alma-Ata, the magnitudes of 7 earthquakes which occurred in northern Tien Shan during measurement of tectonic precursors were calculated and compared to valves based on seismologic measurements. The agreement found is satisfactory. A scientifically well-founded program of tectonic movements by geodetic methods in the northern Tien Shan has thus established the presence of tectonic precursors of earthquakes, determined the distances over which they are manifested and shown the possiblity of using the results of geodetic measurements in combination with geophysical and seismologic data to estimate the possible time of appearance of earthquake precursors. Author

N85-19480# Joint Publications Research Service, Arlington, Va.
TECTONIC POSITION AND FORMATION OF YOUNG ALKALINE PROVINCES OF CONTINENTS AND OCEANS Abstract Only **c46**
V. G. Lazarenkov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 48-49 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geol. (Moscow), no. 7, Jul. 1984 p 84-92 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

Alkaline magmatism of the continents and oceans is compared on the basis of tectonics and formation history. Alkaline provinces are associated with the following major types of tectonic structures: intracontinental rift zones, particularly in Africa, but also in Europe and Asia; pericontinental rift zones around Africa, Australia and Antarctica; alpine geosynclinal belts of Europe, Africa, Asia, North and South America, as well as the islands of the Pacific; oceanic ridges in the western Pacific, Indian and Atlantic Oceans; and mid-oceanic rift belts. The formation of alkaline provinces of late Cretaceous and cenozoic age coincides in position with the world system of young riftogenous and foled geosynclinal structures. Series of alkaline formations of the sodium type show a clear tendency to be related to the rift systems of the Earth, while potassium type formations tend to be associated with geosynclinal structures. The intracontinental rifts have the most complete and best-contrasted series of alkaline and related formations. The sequence of alkaline formations of oceanic rifts is similar to the early members of the sequence of continental formations, with characteristic sodium geochemical specialization. Author

N85-19481# Joint Publications Research Service, Arlington, Va.
MESOZOIC MAGMATISM OF MONGOLIAN-OKHOTSK BELT AND ITS POSSIBLE GEODYNAMIC INTERPRETATION Abstract Only **c46**
V. I. Kovalenko, M. I. Kuzmin, and V. S. Antipin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 49 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geol. (Moscow), no. 7, Jul. 1984 p 93-107 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The geodynamic position of Mesozoic magmatism of the

Mongolian-Okhotsk belt was interpreted by comparing it with contemporary magmatism of certain model regions, the geodynamic conditions of which were well defined. The magmatism of the Mongolian-Okhotsk belt does not match with the geodynamic situation of oceanic or continental rifts, island arcs, or active continental shields, although features of all of these types of areas are observed. The greates milarity is observed with contemporary or late Cenozoic magmatism of western North America, the so-called California model. Charts compare the paleotectonic systems of the Early and late Mesozoic in the Mongolian-Okhotsk belt with the tectonic situation of western North America from the Columbia Plateau to Baja California, extending from the Colorado Plateau in the east into the Pacific in the west. The magmatism of the Mongolian-Okhotsk belt, accompanied by concentrated ore formation, is apparently a result of California-type geodynamic conditions, under which the continental Siberian Plate moved over the Paleothetys mid-oceanic ridge. Author

N85-19482# Joint Publications Research Service, Arlington, Va.
NONLINEAR SEISMOLOGY Abstract Only **c46**
I. A. Beresnev and A. V. Nikolayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 50 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 5, Sep. - Oct. 1984 p 56-62 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

The nature of nonlinear effects in seismology is analyzed. Nonlinear properties of a medium can be considered an independent characterist having anomalies under certain conditions. For example, increased nonlinear properties are manifested by the jointed zones around geological fractures and gas-saturated porous collector zones. New methods of seismic processing the future will study oil and gas deposits in fracture zones. These methods are referred to as nonlinear transillumination methods, which make use of the interaction of eismic waes. If two vibrators operating at different frequencies are placed on the surface, the two incident fields interact strongly in the area between them with nonlinear properties and this area begins to act as a three-dimensional antenna, radiating waves at the combination frequencies. These waves can be recorded at the surface points between the two vibrators and their amplitude, time and direction of arrival can be used to determine the location of the nonlinear area.
Author

N85-19483# Joint Publications Research Service, Arlington, Va.
STATISTICAL STUDY OF ANTHROPOGENIC SEISMIC NOISE WITH IVK-7 COMPUTER SYSTEM Abstract Only **c46**
B. S. Karryyev, Ye. G. Kanel, I. A. Popova, Ye. G. Stroganoz, and V. V. Tsyplakov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 50-51 Transl. into ENGLISH from Izv. Akad. Nauk Turkmenskoy SSR, Ser. Fiz.-Tekhn., Khim. i Geol. Nauk (USSR), no. 3, 1984 p 39-46 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

An installation was set up at the Ashkhabad Central Seismic Station to record anthropogenic seismic noise, using a type IVK-7 computer system to accumulate and analyze the data. Noise at 15 and 30 Hz is processed; digital information obtained in real time is sent to the memory of the SN-3 computer included in the system. A strip chart recorder makes a continuous recording of the noise level at these two frequencies. The statistical characteristics, including distribution density, mean square values of random processes, autocorrelation function and spectral density were analyzed. The possibility is discussed of using the anthropogenic seismic noise from a large city to evaluate the stress state of nearby seismic focal zones. The most informative parameter is the frequency structure of high frequency seismic noise. Long term, continuous observations of the distribution of energy in the seismic noise spectrum may be informative for prediction purposes. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-19484* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jan. 1985 159 p
(NASA-SP-7041(44); NAS 1.21:7041(44)) Avail: NTIS HC $12.50 CSCL 05B

This bibliography lists 579 reports, articles, and other documents introduced into the NASA scientific and technical information system. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economical analysis. Author

N85-19485*# National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.
ANALYSIS OF DATA ACQUIRED BY SYNTHETIC APERTURE RADAR AND LANDSAT MULTISPECTRAL SCANNER OVER KERSHAW COUNTY, SOUTH CAROLINA, DURING THE SUMMER SEASON
S. T. Wu Mar. 1983 46 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Proj. AgRISTARS)
(E85-10071; NASA-TM-87413; NSTL/ERL-213; DC-Y2-04374; NAS 1.15:87413) Avail: NTIS HC A03/MF A01 CSCL 05B

Data acquired by synthetic aperture radar (SAR) and LANDSAT multispectral scanner (MSS) were processed and analyzed to derive forest-related resources inventory information. The SAR data were acquired by using the NASA aircraft X-band SAR with linear (HH, VV) and cross (HV, VH) polarizations and the SEASAT L-band SAR. After data processing and data quality examination, the three polarization (HH, HV, and VV) data from the aircraft X-band SAR were used in conjunction with LANDSAT MSS for multisensor data classification. The results of accuracy evaluation for the SAR, MSS and SAR/MSS data using supervised classification show that the SAR-only data set contains low classification accuracy for several land cover classes. However, the SAR/MSS data show that significant improvement in classification accuracy is obtained for all eight land cover classes. These results suggest the usefulness of using combined SAR/MSS data for forest-related cover mapping. The SAR data also detect several small special surface features that are not detectable by MSS data. A.R.H.

N85-19486*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.
ASSESSMENT OF LANDSAT FOR RANGELAND MAPPING, RUSH VALLEY, UTAH
Merrill K. Ridd, Kevin P. Price, and Gordon E. Douglass Dec. 1984 38 p ERTS
(Grant NAGw-95)
(E85-10072; NASA-CR-174399; NAS 1.26:174399; CRSC-84-9) Avail: NTIS HC A03/MF A01 CSCL 08B

The feasibility of using LANDSAT MSS (multispectral scanner) data to identify and map cover types for rangeland, and to determine comparative condition of the ecotypes was assessed. A supporting objective is to assess the utility of various forms of aerial photography in the process. If rangelands can be efficiently mapped with Landsat data, as supported by appropriate aerial photography and field data, then uniform standards of cover

classification and condition may be applied across the rangelands of the state. Further, a foundation may be established for long-term monitoring of range trend, using the same satellite system over time. Author

N85-19487*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.
AN INTEGRATED GIS/REMOTE SENSING DATA BASE IN NORTH CACHE SOIL CONSERVATION DISTRICT, UTAH: A PILOT PROJECT FOR THE UTAH DEPARTMENT OF AGRICULTURE'S RIMS (RESOURCE INVENTORY AND MONITORING SYSTEM)
Douglas J. Wheeler, Merrill K. Ridd, and John A. Merola Dec. 1984 56 p refs ERTS
(Grant NAGw-95)
(E85-10073; NASA-CR-174400; NAS 1.26:174400; CRSC-84-8) Avail: NTIS HC A04/MF A01 CSCL 05B

A basic geographic information system (GIS) for the North Cache Soil Conservation District (SCD) was sought for selected resource problems. Since the resource management issues in the North Cache SCD are very complex, it is not feasible in the initial phase to generate all the physical, socioeconomic, and political baseline data needed for resolving all management issues. A selection of critical varables becomes essential. Thus, there are foud specific objectives: (1) assess resource management needs and determine which resource factors ae most fundamental for building a beginning data base; (2) evaluate the variety of data gathering and analysis techniques for the resource factors selected; (3) incorporate the resulting data into a useful and efficient digital data base; and (4) demonstrate the application of the data base to selected real world resource management issues. B.G.

N85-19488*# California Univ., Berkeley. Space Sciences Lab.
ANAYSIS OF THE QUALITY OF IMAGE DATA REQUIRED BY THE LANDSAT-4 THEMATIC MAPPER AND MULTISPECTRAL SCANNER Final Technical Report, 3 Jan. 1983 - 31 Dec. 1984
Robert N. Colwell, Principal Investigator 31 Dec. 1984 151 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-27377)
(E85-10074; NASA-CR-174401; NAS 1.26:174401) Avail: NTIS HC A08/MF A01 CSCL 05B

The spatial, geometric, and radiometric qualities of LANDSAT 4 thematic mapper (TM) and multispectral scanner (MSS) data were evaluated by interpreting, through visual and computer means, film and digital products for selected agricultural and forest cover types in California. Multispectral analyses employing Bayesian maximum likelihood, discrete relaxation, and unsupervised clustering algorithms were used to compare the usefulness of TM and MSS data for discriminating individual cover types. Some of the significant results are as follows: (1) for maximizing the interpretability of agricultural and forest resources, TM color composites should contain spectral bands in the visible, near-reflectance infrared, and middle-reflectance infrared regions, namely TM 4 and TM % and must contain TM 4 in all cases even at the expense of excluding TM 5; (2) using enlarged TM film products, planimetric accuracy of mapped poins was within 91 meters (RMSE east) and 117 meters (RMSE north); (3) using TM digital products, planimetric accuracy of mapped points was within 12.0 meters (RMSE east) and 13.7 meters (RMSE north); and (4) applying a contextual classification algorithm to TM data provided classification accuracies competitive with Bayesian maximum likelihood. Author

N85-19489*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF SPECTRAL/RADIOMETRIC CHARACTERISTICS OF THE THEMATIC MAPPER FOR LAND USE APPLICATIONS Quarterly Status Technical Progress Report, 21 Sep. - 20 Dec. 1984
William A. Malila and Michael D. Metzler, Principal Investigators Jan. 1985 35 p refs ERTS
(Contract NAS5-27346)
(E85-10075; NASA-CR-174402; NAS 1.26:174402; ERIM-164000-14-P; QSTPR-9) Avail: NTIS HC A03/MF A01 CSCL 08B

The radiometric characteristics of LANDSAT 5 TM data were analyzed. Effects which were found earlier and quantified in LANDSAT 4 TM data were quantified for LANDSAT-5 data as well, including: scan-direction-related signal droop and scan correlated level shifts. Coincident LANDSAT 4 and 5 fully corrected (CCT-PT) TM data were analyzed, and band-by-band relationships between the two sensors were derived in terms of both signal counts and radiance. A.R.H.

N85-19490*# EROS Data Center, Sioux Falls, S. Dak.
LANDSAT 4 INVESTIGATION OF THEMATIC MAPPER AND MULTISPECTRAL SCANNER APPLICATIONS Quarterly Report
Donald T. Lauer, Principal Investigator 6 Nov. 1984 3 p
(NASA Order S-10757-C)
(E85-10076; NASA-CR-174403; NAS 1.26:174403; PCN902-91548) Avail: NTIS HC A02/MF A01 CSCL 05B

A comparison of methods for selecting optimum TM band combinations for visual interpretation of data are examined. Two statistical methods and visual interpretation by experienced photointerpreters are compared using photographic chips of 1:250,000 scale prints and the digital equivalent of the chips. A mosaic of TM data of the Great Salt Lake area of Utah was done. The filtering process was reviewed since the results were not satisfactory. B.G.

N85-19491*# Arizona Univ., Tucson. Optical Sciences Center.
SPECTRORADIOMETRIC CALIBRATION OF THE THEMATIC MAPPER AND MULTISPECTRAL SCANNER SYSTEM Quarterly Report, 1 Aug. - 31 Oct. 1984
Philip N. Slater and James M. Palmer, Principal Investigators 4 Dec. 1984 39 p refs ERTS
(Contract NAS5-27382)
(E85-10077; NASA-CR-174404; NAS 1.26:174404; QR-8) Avail: NTIS HC A03/MF A01 CSCL 08B

Radiometric measurements were taken on the morning of the LANDSAT 5 Thematic Mapper overpass. The sky was cloud free and the sites were dry. Barnes multiband radiometer data were collected for a 4 x 4 pixel area and two fractional pixel areas of slightly higher and lower reflectances than the larger area. Helicopter color photography was obtained of all the ground areas. This photography will allow a detailed reflectance map of the 4 x 4 pixel are to be made and registered to the TM imagery to an accuracy of better than half a pixel. Spectropolarimeter data were also collected of the 4 x 4 pixel area from the helicopter. In addition, ground based solar radiometer data were collected to provide spectral extinction optical thickness valves. The radiative transfer theory used in the development of the Herman code which was used in predicting the TM entrance pupil spectral radiances from the ground based measurements is described. B.G.

N85-19492*# Santa Barbara Research Center, Goleta, Calif.
THEMATIC MAPPER: DESIGN THROUGH FLIGHT EVALUATION Final Report
Dec. 1984 208 p refs Revised Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-24200)
(E85-10078; NASA-CR-174405; NAS 1.26:174405) Avail: NTIS HC A10/MF A01 CSCL 14B

LANDSAT 4 and 5, launched in 1982 and 1984, not only carried the Thematic Mapper, but were redesigned to handle the increased data rates associated with it, and to communicate that data to Earth via geosynchronous orbiting Tracking and Data Relay Satellites (TDRS). The TM development program is summarized. A brief historical perspective is presented of the evolution of design requirements and hardware development. The basic performance parameters that serve as sensor design guidelines are presented. B.G.

N85-19493*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BRAZILIAN REMOTE SENSING RECEIVING, RECORDING AND PROCESSING GROUND SYSTEMS IN THE 1980'S
Nelson de Jesus Parada, Principal Investigator Oct. 1984 15 p Presented at the 18th Intern. Symp. of the Environ., Paris, 1-5 Oct. 1984 Sponsored by NASA ERTS
(E85-10079; NASA-CR-174406; NAS 1.26:174406;
INPE-3312-PRE/619) Avail: NTIS HC A02/MF A01 CSCL 05B

A ground station was built in Brazil to receive, record, and process TM data from LANDSAT satellites. The receiving/recording subsystem and the processing subsystem are discussed. Functional design specifications for the facility are addressed. R.S.F.

N85-19494*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
GROWTH AND REFLECTANCE CHARACTERISTICS OF WINTER WHEAT CANOPIES
L. D. Hinzman, M. E. Bauer (Minnesota Univ.), and C. S. T. Daughtry 14 Nov. 1984 21 p refs ERTS
(Contract NAS9-16528)
(E85-10080; NASA-CR-171843; NAS 1.26:171843;
LARS-TR-111484) Avail: NTIS HC A02/MF A01 CSCL 02C

A valuable input to crop growth and yield models would be estimates of current crop condition. If multispectral reflectance indicates crop condition, then remote sensing may provide an additional tool for crop assessment. The effects of nitrogen fertilization on the spectral reflectance and agronomic characteristics of winter wheat (Triticum aestivum L.) were determined through field experiments. Spectral reflectance was measured during the 1979 and 1980 growing seasons with a spectroradiometer. Agronomic data included total leaf N concentration, leaf chlorophyll concentration, stage of development, leaf area index (LAI), plant moisture, and fresh and dry phytomass. Nitrogen deficiency caused increased visible, reduced near infrared, and increased middle infrared reflectance. These changes were related to lower levels of chlorophyll and reduced leaf area in the N-deficient plots. Green LAI, an important descriptor of wheat canopies, could be reliably estimated with multispectral data. The potential of remote sensing in distinguishing stressed from healthy crops is demonstrated. Evidence suggests multispectral imagery may be useful for monitoring crop condition. R.S.F.

N85-19495*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
TECHNIQUES FOR MEASURING INTERCEPTED AND ABSORBED PAR IN CORN CANOPIES
K. P. Gallo and C. S. T. Daughtry 14 Nov. 1984 20 p refs ERTS
(Contract NAS9-16528)
(E85-10081; NASA-CR-171842; NAS 1.26:171842;
LARS-TR-111284) Avail: NTIS HC A02/MF A01 CSCL 02C

The quantity of radiation potentially available for photosynthesis that is captured by the crop is best described as absorbed photosynthetically active radiation (PAR). Absorbed PAR (APAR) is the difference between descending and ascending fluxes. The four components of APAR were measured above and within two planting densities of corn (Zea mays L.) and several methods of measuring and estimating APAR were examined. A line quantum sensor that spatially averages the photosynthetic photon flux density provided a rapid and portable method of measuring APAR. PAR reflectance from the soil (Typic Argiaquoll) surface decreased from 10% to less than 1% of the incoming PAR as the canopy cover increased. PAR reflectance from the canopy decreased to less than 3% at maximum vegetative cover. Intercepted PAR (1 - transmitted PAR) generally overestimated absorbed PAR by less than 4% throughout most of the growing season. Thus intercepted PAR appears to be a reasonable estimate of absorbed PAR. A.R.H.

N85-19496*# Hunter Coll., New York. Dept. of Geology and Geography.
PRELIMINARY EVALUATION OF THE AIRBORNE IMAGING SPECTROMETER FOR VEGETATION ANALYSIS Final Report
Alan H. Strahler and Curtis E. Woodcock Mar. 1984 32 p ref Sponsored by NASA Prepared for JPL, Pasadena, Calif. Original contains color illustrations
(Contract JPL-956585)
(NASA-CR-174440; JPL-9950-956; NAS 1.26:174440) Avail: NTIS HC A03/MF A01 CSCL 02C

The primary goal of the project was to provide ground truth and manual interpretation of data from an experimental flight of the Airborne Infrared Spectrometer (AIS) for a naturally vegetated test site. Two field visits were made; one trip to note snow conditions and temporally related vegetation states at the time of the sensor overpass, and a second trip following acquisition of prints of the AIS images for field interpretation. Unfortunately, the ability to interpret the imagery was limited by the quality of the imagery due to the experimental nature of the sensor. B.W.

N85-19497*# Texas Univ., Dallas.
SIR-A IMAGERY IN GEOLOGIC STUDIES OF THE SIERRA MADRE ORIENTAL, NORTHEASTERN MEXICO. PART 1 (REGIONAL STRATIGRAPHY): THE USE OF MORPHOSTRATIGRAPHIC UNITS IN REMOTE SENSING MAPPING
Jose F. Longoria and Oscar H. Jimenez [1985] 37 p refs Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-956432)
(NASA-CR-175457; JPL-9950-983; NAS 1.26:175457) Avail: NTIS HC A03/MF A01 CSCL 08B

SIR-A imaging was used in geological studies of sedimentary terrains in the Sierra Madre Oriental, northeastern Mexico. Geological features such as regional strike and dip, bedding, folding and faulting were readily detected on the image. The recognition of morphostructural units in the imagery, coupled with field verification, enabled geological mapping of the region at the scale of 1:250 000. Structural profiling lead to the elaboration of a morphostructural map allowing the recognition of an echelon folds and field trends which were used to postulate the ectonic setting of the region. Author

N85-19498*# Texas Univ., Dallas.
POST-CARBONIFEROUS TECTONICS IN THE ANADARKO BASIN, OKLAHOMA: EVIDENCE FROM SIDE-LOOKING RADAR IMAGERY
K. C. Nielsen and R. J. Stern [1985] 18 p refs Submitted for publication Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-956430)
(NASA-CR-175458; JPL-9950-982; NAS 1.26:175458;
UTD-Contrib-471) Avail: NTIS HC A02/MF A01 CSCL 17I

The Anadarko Basin of western Oklahoma is a WNW-ESE elongated trough filled with of Paleozoic sediments. Most models call for tectonic activity to end in Pennsylvanian times. NASA Shuttle Imaging Radar revealed a distinctive and very straight lineament set extending virtually the entire length of the Anadarko Basin. The lineaments cut across the relatively flat-lying Permian units exposed at the surface. The character of these lineaments is seen most obviously as a tonal variation. Major streams, including the Washita and Little Washita rivers, appear to be controlled by the location of the lineaments. Subsurface data indicate the lineaments may be the updip expression of a buried major fault system, the Mountain View fault. Two principal conclusions arise from this analysis: (1) the complex Mountain View Fault system appears to extend southeast to join the Reagan, Sulphur, and/or Mill Creek faults of the Arbuckle Mountains, and (2) this fault system has been reactivated in Permian or younger times. R.S.F.

N85-19499*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TECTONIC LINEAMENTS IN THE CENOZOIC VOLCANICS OF SOUTHERN GUATEMALA: EVIDENCE FOR A BROAD CONTINENTAL PLATE BOUNDARY ZONE
M. Baltuck and T. H. Dixon [1984] 23 p refs Submitted for publication Prepared in cooperation with Tulane Univ., New Orleans

(Contract JPL-956426)
(NASA-CR-175456; JPL-9950-984; NAS 1.26:175456) Avail: NTIS HC A02/MF A01 CSCL 08B

The northern Caribbean plate boundary has been undergoing left lateral strike slip motion since middle Tertiary time. The western part of the boundary occurs in a complex tectonic zone in the continental crust of Guatemala and southernmost Mexico, along the Chixoy-Polochic, Motogua and possibly Jocotan-Chamelecon faults. Prominent lineaments visible in radar imagery in the Neogene volcanic belt of southern Guatemala and western El Salvador were mapped and interpreted to suggest southwest extensions of this already broad plate boundary zone. Because these extensions can be traced beneath Quaternary volcanic cover, it is thought that this newly mapped fault zone is active and is accommodating some of the strain related to motion between the North American and Caribbean plates. Onshore exposures of the Motoqua-Polochic fault systems are characterized by abundant, tectonically emplaced ultramafic rocks. A similar mode of emplacement for these off shore ultramafics, is suggested. R.S.F.

N85-19500*# California Univ., Davis. Dept. of Botany.
VEGETATION ANALYSIS FOR ARID LANDS GEOBOTANY Final Report
Michael G. Barbour and Susan L. Ustin [1985] 35 p Sponsored by NASA
(Contract JPL-956982)
(NASA-CR-175455; JPL-9950-987; NAS 1.26:175455) Avail: NTIS HC A03/MF A01 CSCL 08B

Three primary study sites were selected for measurement of plant phenological properties and spectral analysis. The sites selected represented typical sagebrush, creosote bush, and saltbush communities in Owens Valley, CA. Community composition was studied at these three sites plus five burned sites. Ten 50 m transects at each locality were measured for percent cover (over 10 cm) by a given species. On each transect two point quarter and five nearest neighbor analyses were conducted. These data provided percent cover, cover by area, plant size, tendency for association, and recolonization patterns after a disturbance. Plots representing percentage plant cover for six sites are included. R.S.F.

N85-19501# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING ACTIVITIES IN LATIN AMERICA
Nelson de Jesus Parada Sep. 1984 15 p Presented at the 18th Intern. Symp. on Remote Sensing of Environ., Paris, 1-5 Oct. 1984
(INPE-3297-PRE/612) Avail: NTIS HC A02/MF A01

The status of remote sensing in Latin America is discussed, including the reasons, motivations, and importance of remote sensing activities in the Latin American environment. In the field of data reception, processing, distribution, and utilization, the efforts made to improve those aspects which are vital to the whole process of remote sensing are presented. Specific countries with their programs and projects are mentioned briefly. The Brazilian remote sensing eperiment (BRESEX) and its future utilization on the Brazilian complete space mission on board the shuttle is considered. Finally, the importance of regional societies, symposia, and training programs is addressed. R.S.F.

N85-19502# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE SHARING OF REMOTE SENSING TECHNIQUES IN BRAZILIAN GEOGRAPHIC RESEARCH [A PARTICIPACAO DAS TECNICAS DE SENSORIAMENTO REMOTO NA PESQUISA GEOGRAFICA BRASILEIRA]
Evlyn Marcia Leao deMoraes Novo Oct. 1984 18 p refs In PORTUGUESE; ENGLISH summary Submitted for publication
(INPE-3307-PRE/617) Avail: NTIS HC A02/MF A01

Some observations about how the Brazilian geographical community was dealing with remote sensing are presented. The remote sensing technical communication published by geographical journals and the frequency of geographers who attended to the 1st and 2nd Brazilian symposium of Remote Sensing are evaluated. Results present a contradiction between the relative high geographers attendance to the remote sensing symposia and the small scientific production related to this subject. Results also suggested that the academic geographical community should increase its interest on remote sensing, so as to improve remote sensing applications to geographical research. Author

N85-19503# Titan Systems, Inc., Vienna, Va.
NAUTICAL CHARTING WITH REMOTELY SENSED IMAGERY, VOLUME 1
J. Passauer, M. Ragusky, J. Korak, and W. Cover Nov. 1984 191 p 2 Vol.
(Contract DMA800-83-C-0056)
(AD-A149361; AD-F300533) Avail: NTIS HC A09/MF A01 CSCL 08/2

Organized in two volumes, this study is designed as a guide and reference for the hydrographic cartographer in using remotely sensed imagery to delineate coastal areas and that phenomena associated with coastal areas. Volume 1 is the basic text, covering charts and missions, coastal geomorphology, coastal classification, oceanography, remote sensing and hydrographic charting. It contains a glossary, a list of abbreviations and acronyms, and a bibliography applicable to both volumes. Volume 2 supports Volume 1, under a parallel plan of organization, by presenting case studies using imagery examples with analysis. GRA

N85-19504# Titan Systems, Inc., Vienna, Va.
NAUTICAL CHARTING WITH REMOTELY SENSED IMAGERY. VOLUME 2: CASE STUDIES
J. Passauer, M. Ragusky, J. Korak, and W. Cover Nov. 1984 187 p 2 Vol.
(Contract DMA800-83-C-0056)
(AD-A149362; AD-F300533) Avail: NTIS HC A09/MF A01 CSCL 08/6

Organized in two volumes each of which can be used separately, this study is designed as a guide and reference for the hydrographic cartographer in using remotely sensed imagery to chart coastal and shallow sea features. Volume I is the basic text, covering charts and missions, coastal geomorphology, coastal classification, oceanography, remote sensing, and hydrographic charting. It contains a glossary, a list of abbreviations and acronyms, and a bibliography applicable to both volumes. Volume II is designed to stand alone and present case studies using world-wide imagery examples with analysis. Examples of imagery range from archival to the latest imagery available at the compiliation deadline including the European Space Agency Metric Camera and the NASA Large Format Camera. Imagery acquired from high altitude aircraft were also included. GRA

N85-19505# Tennessee Valley Authority, Chattanooga. Div. of Air and Water Resources.
NATIONWIDE URBAN RUNOFF PROGRAM. RELATIONSHIP OF URBAN RUNOFF TO LAND USE AND GROUNDWATER RESOURCES Final Report, 1980 - 1984
Jack D. Milligan, I. Elaine Wallace, and Roger P. Betson Mar. 1984 322 p refs
(Grant EPA-P-004109-01-8)
(PB85-114692; TVA/ONRED-AWQ-84-1) Avail: NTIS HC A14/MF A01 CSCL 08H

This document presented data collected by TVA under an agreement with the Knoxville-Knox County Metropolitan Planning Commission, with respect to quantity of rainfall, runoff, and groundwater flow, and with respect to quality, of rainfall, dry precipitation, and stormwater runoff. Various statistical and numerical analyses of these data have been performed with the aim of providing a data base amenable to a local perspective interpretation, which information is also included. GRA

N85-19506# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Environmental Research Lab.
PATHFINDER: A TRAJECTORY PREDICTION SYSTEM FOR THE GREAT LAKES

David J. Schwab, John R. Bennett, and Edward W. Lynn May 1984 44 p refs
(PB85-115335; NOAA-TM-ERL-GLERL-83) Avail: NTIS HC A03/MF A01 CSCL 08H

This report describes a series of computer programs that can be used interactively to simulate currents and particle trajectories on the Great Lakes. The user of the program supplies meteorological data and initial particle locations. The programs allow the user to examine predicted currents, particle locations, and particle paths in several different formats. Author (GRA)

N85-19507# Geological Survey, Tuscaloosa, Ala. Water Resources Div.
WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1983 Annual Water-Data Report, 1 Oct. 1982 - 30 Sep. 1983
H. C. Rollins, F. C. Sedberry, E. G. Ming, and J. W. Tucker Jul. 1984 471 p
(PB85-123842; USGS/WRD/HD-84/059; USGS/WDR/AL-83/1) Avail: NTIS HC A20/MF A01 CSCL 08H

Water resources data for the 1983 water year for Alabama consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 86 gaging stations; stage only for 18 gaging stations, stage and contents for 13 lakes and reservoirs; water quality for 78 gaging stations, 47 wells, 2 precipitation stations, and water levels for 53 observation wells. Also included are 5 crest-stage partial record stations, 6 flood hydrograph partial-record stations and 55 water-quality partial-record stations. Author (GRA)

N85-19508# Geological Survey, Urbana, Ill. Water Resorces Div.
WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1983. VOLUME 1: ILLINOIS EXCEPT ILLINOIS RIVER BASIN Annual Water-Data Report, 1 Oct. 1982 - 30 Sep. 1983
R. L. Stahl, K. K. Fitzgerald, T. E. Richards, and P. D. Hayes Jul. 1984 460 p refs Sponsored in part by State of Illinois
(PB85-125755; USGS/WRD/HD-84/057; USGS/WDR/IL-83/1) Avail: NTIS HC A20/MF A01 CSCL 08H

Water resources data for the 1983 water year for Illinois consist of reords of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels of ground-water wells. This volume contains records for water discharge at 76 gaging stations; stage at 15 gaging stations; stage and contents at 3 lakes and reservoirs; and water quality at 115 gaging stations. Also included are data for 13 crest-stage partial-record stations. Author (GRA)

N85-19509# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Environmental Research Lab.
FREEZE-UP, BREAKUP AND DATE OF MAXIMUM ICE THICKNESS FOR THE SAINT LAWRENCE RIVER, 1971 - 1978
G. M. Greene Aug. 1984 28 p refs
(PB85-119451; NOAA-DR-ERL-GLERL-27) Avail: NTIS HC A03/MF A01 CSCL 08L

Ten years of ice cover observations (1971-81) for 12 stations along the international section of the St. Lawrence River are summarized. For each station and season, the tables list date of freeze-over, data ice free, duration of solid ice cover, maximum ice thickness, and date of maximum ice thickness. Observations were taken during a period that contained 5 winters colder than normal and 5 winters warmer than normal, when compared to an 80-year record of air temperatures. Author (GRA)

N85-19449# Joint Publications Research Service, Arlington, Va.
ATLAS OF SNOW AND ICE RESOURCES Abstract Only
In its USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 9 refs Transl. into ENGLISH from Tass (Tallinn, USSR), 29 May 1984 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19455# Joint Publications Research Service, Arlington, Va.
SILVER METALLOGENY IN EARTH'S PACIFIC OCEAN SEGMENT Abstract Only
A. D. Shcheglov, V. G. Khomich, and I. N. Govorov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 22 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk, USSR), no. 4, Jul. - Aug. 1984 p 3-14 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19463# Joint Publications Research Service, Arlington, Va.
ALUMINUM IN BIOGENIC CYCLE AND FORMS OF ITS OCCURENCE IN OCEAN Abstract Only
L. L. Demina, A. P. Lisitsyn, and V. N. Lukashin *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 26-27 Transl. into ENGLISH from Izv. Akad. Nauk SSSR., Ser. Geol. (Moscow), no. 9, Sep. 1984 p 79-84 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19478# Joint Publications Research Service, Arlington, Va.
APPROXIMATION OF DIFFERENCE IN WATER TABLE POSITIONS BY HORIZONTAL STRATUM IN STUDIES OF THEIR INFLUENCE ON GRAVITY Abstract Only
M. K. Kurbanov and O. B. Kirsta *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 46 Transl. into ENGLISH from Izv. Akad. Nauk Turkmenskoy SSR, Ser. Fiz.-Tekhn., Khim. i Geol. Nauk (USSR), no. 2, 1984 p 65-71 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19248*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
UTILIZATION OF MOBILE VLBI FOR GEODETIC MEASUREMENTS
J. M. Davidson and D. W. Trask *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 248-266 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 08E

N85-19321# Joint Publications Research Service, Arlington, Va.
CNES, INRA DO JOINT REMOTE-SENSING RESEARCH
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-006) 26 Feb. 1985 p 54-55 Transl. into ENGLISH from Electron. Actualites (Paris), 16 Nov. 1984 p 21 (For primary document see N85-19314 10-32)
Avail: NTIS HC A04/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-19510*# National Aeronautics and Space Administration, Washington, D. C.
DEVELOPMENT OF MEDIA FOR DYNAMIC LATENT HEAT STORAGE FOR THE LOW-TEMPERATURE RANGE. PART 1: THERMAL ANALYSES OF SELECTED SALT HYDRATE SYSTEMS
Herbert Kanwischer and Rainer Tamme Jan. 1985 75 p refs Transl. into ENGLISH of "Entwicklung von Medien fur Dynamische Latentwarmespeicher im Niedertemperaturbereich Teil 1: Thermoanalytische Untersuchungen Ausgewahlter Salzhydratsysteme" rept. DFVLR-FB-84-03-Pt-1 DFVLR, Stuttgart, Dec. 1983 p 1-76 Original languge document was announced as N84-25170 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-4004)
(NASA-TM-77778; NAS 1.15:77778; DFVLR-FB-84-03-Pt-1) Avail: NTIS HC A04/MF A01

Phase change temperatures and phase change enthalpies of seventeen salt hydrates, three double salts, and four eutectics were measured thermodynamically and the results reported herein. Good results were obtained, especially for congruently melting salt hydrates. Incongruently melting salt hydrates appear less suitable for heat storage applications. The influence of the second phase - water, acid and hydroxide - to the latent heat is described. From these results, basic values of the working temperatures and storage capabilities of various storage media compositions may be derived. Author

N85-19511*# Stonehart Associates, Inc., Madison, Conn.
PREPARATION AND EVALUATION OF ADVANCED CATALYSTS FOR PHOSPHORIC ACID FUEL CELLS Final Report
Paul Stonehart, John Baris, John Hockmuth, and Peter Pagliaro Jun. 1984 138 p
(Contracts DEN3-176; DE-AI21-80ET-17088)
(NASA-CR-168223; NAS 1.26:168223) Avail: NTIS HC A07/MF A01 CSCL 10A

The platinum electrocatalysts were characterized for their crystallite sizes and the degree of dispersion on the carbon supports. One application of these electrocatalysts was for anodic oxidation of hydrogen in hot phosphoric acid fuel cells, coupled with the influence of low concentrations of carbon monoxide in the fuel gas stream. In a similar way, these platinum on carbon electrocatalysts were evaluated for oxygen reduction in hot phosphoric acid. Binary noble metal alloys were prepared for anodic oxidation of hydrogen and noble metal-refractory metal mixtures were prepared for oxygen reduction. An exemplar alloy of platinum and palladium (50/50 atom %) was discovered for anodic oxidation of hydrogen in the presence of carbon monoxide, and patent disclosures were submitted. For the cathode, platinum-vanadium alloys were prepared showing improved performance over pure platinum. Preliminary experiments on electrocatalyst utilization in electrode structures showed low utilization of the noble metal when the electrocatalyst loading exceeded one weight percent on the carbon. A.R.H.

N85-19512*# Applied Solar Energy Corp., City of Industry, Calif.
INTERMEDIATE LOAD MODULES FOR TEST AND EVALUATION: FLAT-PLATE SOLAR ARRAY PROJECT Final Design Report
Mark J. Bower 30 Mar. 1985 21 p Sponsored in part by DOE Prepared for JPL
(NASA-CR-174450; JPL-9950-915; DOE/JPL-956350-1; NAS 1.26:174450; DRL-187; DRD-SE-2) Avail: NTIS HC A02/MF A01 CSCL 10A

Two versions of a 36 stainless steel solar module were built. The first version was built as a commercial module for marine applications and was purchased for evaluation by JPL. Design deficiencies were identified as a result of the evaluation. The second version was built and the improvements that resulted from design changes are described. Assembly problems, electrical performance, and qualification test results are provided. Author

N85-19513*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
DIODES IN PHOTOVOLTAIC MODULES AND ARRAYS Final Report
15 Mar. 1984 88 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-956254)
(NASA-CR-175454; JPL-9950-916; DOE/JPL-956254-2; NAS 1.26:175454) Avail: NTIS HC A05/MF A01 CSCL 10A

The use of diodes to enhance the energy generation capability and improve the reliability of photovoltaic modules and arrays is discussed. Array-level considerations influencing the application of such diodes in a bypass mode are conserved. Several methods for the mechanical and electrical integration of these devices as an integral part of the module electrical termination means are described. Particular emphasis is placed on the description of innovative approaches for the external mounting of bypass diodes. These descriptions were used as the basis for a detailed cost analysis and comparison among the candidate concepts. It was concluded that the photovoltaic source circuit blocking or isolation function can be implemented using the same basic diode enclosure designs with provisions for the inclusion of a fuse for overcurrent protection. Author

N85-19514*# Astrosystems International, Inc., Newark, Del. Astropower Div.
SILICON FILM SOLAR CELL PROCESS Quarterly Report
Robert B. Hall, James B. McNeely, and Allen M. Barnett 15 May 1984 15 p refs Sponsored by NASA
(NASA-CR-174446; DOE/JPL-956769-01; JPL-1; NAS 1.26:174446) Avail: NTIS HC A02/MF A01 CSCL 10A

The most promising way to reduce the cost of silicon in solar cells while still maintaining performance is to utilize thin films (10 to 20 microns thick) of crystalline silicon. The method of solution growth is being employed to grow thin polycrystalline films of silicon on dissimilar substrates. The initial results indicate that, using tin as the solvent, this growth process only requires operating temperatures in the range of 800 C to 1000 C. Growth rates in the range of 0.4 to 2.0 microns per minute and grain sizes in the range of 20 to 100 microns were achieved on both quartz and coated steel substrates. Typically, an aspect ratio of two to three between the width and the Si grain thickness is seen. Uniform coverage of Si growth on quartz over a 2.5 x 2.5 cm area was observed. Author

N85-19515*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
STRESS STUDIES IN EFG Quarterly Progress Report, 1 Apr. - 30 Jun. 1984
30 Jun. 1984 73 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956312)
(NASA-CR-174441; DOE/JPL-956312-08; JPL-9950-948; NAS 1.26:174441) Avail: NTIS HC A04/MF A01 CSCL 10A

Electrical characterization of defects induced in FZ and CZ silicon stress in four point bending above 1200 C was started. Techniques to study electrical activity that permit correlation of defect activity with diffusion length and with room and low temperature EBIC are being developed. Preliminary characterization of defects in ribbon grown at very low speeds of less than 1 cm/min shows that the dislocation density is very low over significant regions of cross section, while regions of high dislocation density occur in bands in a number of places. Additional measurements of stress distributions in edge defined film fed growth (EFG) material were obtained at the University of Illinois using shadow Moire interferometry. R.S.F.

N85-19516*# Florida Univ., Gainesville. Dept. of Electrical Engineering.
SURFACE AND ALLIED STUDIES IN SILICON SOLAR CELLS Annual Report, 24 Jun. 1983 - 23 Jun. 1984
F. A. Lindholm 23 Jun. 1984 64 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956525)
(NASA-CR-175468; DOE/JPL-956525-83/4; JPL-9950-950; NAS 1.26:175468) Avail: NTIS HC A04/MF A01 CSCL 10A

Measuring small-signal admittance versus frequency and forward bias voltage together with a new transient measurement apparently provides the most reliable and flexible method available for determining back surface recombination velocity and low-injection lifetime of the quasineutral base region of silicon solar cells. The new transient measurement reported here is called short-circuit-current decay (SCCD). In this method, forward voltage equal to about the open-circuit or the maximum power voltage establishes excess holes and electrons in the junction transition region and in the quasineutral regions. The sudden application of a short circuit causes an exiting of the excess holes and electrons in the transition region within about ten picoseconds. From observing the slope and intercept of the subsequent current decay,

the base lifetime and surface recombination velocity can be determined. The admittance measurement previously mentioned then enters to increase accuracy particularly for devices for which the diffusion length exceeds the base thickness. B.W.

N85-19517*# ARCO Solar, Inc., Chatsworth, Calif.
PULSED EXCIMER LASER PROCESSING FOR COST-EFFECTIVE SOLAR CELLS Quarterly Report, May - Jul. 1984
D. Wong Jul. 1984 75 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956831)
(NASA-CR-174429; DOE/JPL-956831-1; JPL-9950-964; NAS 1.26:174429; QR-1) Avail: NTIS HC A04/MF A01 CSCL 10A

A solar cell process sequence that incorporates three process steps which use pulsed excimer lasers is developed. The development of high efficiency cells at a low cost is a major objective. The three process teps are: (1) junction formation; (2) surface passivation; and (3) front metallization. During this reporting period, a series of annealing experiments were conducted. Parameter variations included beam energy density, percentage of beam overlap, sources of diffusant, and different surface conditions such as chemical mechanical polished, caustic etched, and textured. Diffusant deposition included spin on liquid dopant and ion implant. Due to the lower surface reflectivity and the wetting effect by the spin on source, textured wafers experienced more surface damage and stress than polished wafers. Maximum cell efficiency was 11.5% (no A/R). Surface damage limited the cell efficiency. B.W.

N85-19518*# Purdue Univ., Lafayette, Ind.
MOD SILVER METALLIZATION FOR PHOTOVOLTAICS Quarterly Technical Report, 1 Jun. - 31 Aug. 1984
G. M. Vest and R. W. Vest 28 Sep. 1984 43 p Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-956697)
(NASA-CR-174444; DOE/JPL-956679-84/3; JPL-9950-966; NAS 1.26:174444) Avail: NTIS HC A03/MF A01 CSCL 10A

Metallo organic decomposition (MOD) formed silver platinum inks in photovoltaic cell films were studied. Silver platinum conductor inks containing Pt-2 ethydehexonate (SPCI inks) were evaluated to determine: (1) a standard firing process to produce films; (2) the film's solder leach resistance; and (3) film to substrate adhesion. A standard firing sequence of 90 minutes duration in a belt kiln, at various temperatures ranging from 25 to 292 C was developed. Due to the composition of the films it was found that the Du Pont test for solder leaching resistance was an unacceptable method. Fired pad - separation from substrate methods of adhesion testing were also considered unacceptable, thus the Scotch tape method of adhesion testing was employed. Results show that a new method for solder leach testing needs to be developed and that the long term adhesion characteristics of the films require improvement. G.L.C.

N85-19519*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
INVESTIGATION OF WELDED INTERCONNECTION OF LARGE AREA WRAPAROUND CONTACTED SILICON SOLAR CELLS Final Report
Dan R. Lott Aug. 1984 42 p Sponsored by NASA. Lewis Research Center Prepared for JPL, Pasadena, Calif.
(Contract JPL-956020)
(NASA-CR-174438; JPL-9950-975; NAS 1.26:174438; LMSC-D973421) Avail: NTIS HC A03/MF A01 CSCL 10A

An investigation was conducted to evaluate the welding and temperature cycle testing of large area 5.9 x 5.9 wraparound silicon solar cells utilizing printed circuit substrates with SSC-155 interconnect copper metals and the LMSC Infrared Controlled weld station. An initial group of 5 welded modules containing Phase 2 developmental 5.9 x 5.9 cm cells were subjected to cyclical temperatures of + or 80 C at a rate of 120 cycles per day. Anomalies were noted in the adhesion of the cell contact metallization; therefore, 5 additional modules were fabricated and tested using available Phase I cells with demonstrated contact integrity. Cycling of the later module type through 12,000 cycles indicated the viability of this type of lightweight flexible array concept. This project demonstrated acceptable use of an alternate interconnect copper in combination with large area wraparound cells and emphasized the necessity to implement weld pull as opposed to solder pull procedures at the cell vendors for cells that will be interconnected by welding. B.W.

N85-19520*# ARCO Solar, Inc., Chatsworth, Calif.
PULSED EXCIMER LASER PROCESSING FOR COST-EFFECTIVE SOLAR CELLS Quarterly Report, Aug. - Oct. 1984
D. Wong Oct. 1984 58 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956831)
(NASA-CR-175465; DOE/JPL-956831-2; JPL-9950-990; NAS 1.26:175465; QR-2) Avail: NTIS HC A04/MF A01 CSCL 10A

Junction formation optimization for solar cells was addressed. Improved cell efficiency was demonstrated by use of a large beam size laser of more homogeneous output. However, the cost of operating such a high power laser is presently considered too large for production use. Its slow processing speed also retarded experimentation. A smaller laser was reactivated with the installation of homogenizing lenses to produce more uniform and reproducible beam output. The highest Cz cell efficiency obtained was above 15.8%. Factors which presently limit efficiency include non-ideal ion implant potential for shallow junction formation, insufficient beam homogeneity, and metallization shadowing. Wafer surface condition before laser annealing was found to affect cell performance. R.S.F.

N85-19521*# Westinghouse Research and Development Center, Pittsburgh, Pa.
DEVELOPMENT OF HIGH EFFICIENCY SOLAR CELLS ON SILICON WEB Quarterly Progress Report, Jul. - Sep. 1984
A. Rohatgi, D. L. Meier, R. B. Campbell, D. N. Schmidt, and P. Rai-Choudhury 21 Nov. 1984 34 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956786)
(NASA-CR-174435; DOE/JPL-956786-84/2; JPL-9950-991; NAS 1.26:174435; QR-2) Avail: NTIS HC A03/MF A01 CSCL 10A

Web base material is being improved with a goal toward obtaining solar cell efficiencies in excess of 18% (AM1). Carrier loss mechanisms in web silicon was investigated, techniques were developed to reduce carrier recombination in the web, and web cells were fabricated using effective surface passivation. The effect of stress on web cell performance was also investigated. B.G.

N85-19522*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
STRESS STUDIES IN EFG Quarterly Progress Report, 1 Jul. - 30 Sep. 1984
30 Sep. 1984 29 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956312)
(NASA-CR-175464; DOE/JPL-956312-09; NAS 1.26:175464) Avail: NTIS HC A03/MF A01 CSCL 10A

The electrical properties of defects, particularly dislocations, in limiting EFG material bulk lifetime using EBIC are being examined. Initial work involved developing a quantitative high resolution method to correlate current collection in the EBIC mode to bulk lifetime measurements. More detailed analysis of creep behavior deduced from high temperature four point bending experiments shows that the silicon sheet responds like a plastic solid above 1200 C. The implication of this in stress analysis are being investigated. An EFG system for growth of 5 cm ribbon produced lower dislocation material and will be used to test the stress analysis modeling. Characterization of low resistivity EFG material is in progress to study defect structure changes with dopant concentration and to correlate to cell performance degradation. A.R.H.

N85-19523*# Solarex Corp., Rockville, Md.
PROCESS RESEARCH ON POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Final Technical Report

J. S. Culik and C. Y. Wrigley [1985] 40 p refs Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956698)
(NASA-CR-175461; DOE/JPL-956698-84/8; JPL-9950-996; NAS 1.26:175461) Avail: NTIS HC A03/MF A01 CSCL 10A

Results of hydrogen-passivated polycrysalline silicon solar cell research are summarized. The short-circuit current of solar cells fabricated from large-grain cast polycrystalline silicon is nearly equivalent to that of single-crystal cells, which indicates long bulk minority-carrier diffusion length. Treatments with molecular hydrogen showed no effect on large-grain cast polycrystalline silicon solar cells. R.S.F.

N85-19524*# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
INVESTIGATION OF ACCELERATED STRESS FACTORS AND FAILURE/DEGRADATION MECHANISMS IN TERRESTRIAL SOLAR CELLS Annual Report
Jay W. Lathrop Sep. 1984 79 p refs Sponsored in part by DOE Prepared for JPL
(NASA-CR-175469; DOE/JPL-954929-84/11; NAS 1.26:175469; DRD-SE-7; AR-5) Avail: NTIS HC A05/MF A01 CSCL 10A

Research on the reliability of terrestrial solar cells was performed to identify failure/degradation modes affecting solar cells and to relate these to basic physical, chemical, and metallurgical phenomena. Particular concerns addressed were the reliability attributes of individual single crystalline, polycrystalline, and amorphous thin film silicon cells. Results of subjecting different types of crystalline cells to the Clemson accelerated test schedule are given. Preliminary step stress results on one type of thin film amorphous silicon (a:Si) cell indicated that extraneous degradation modes were introduced above 140 C. Also described is development of measurement procedures which are applicable to the reliability testing of a:Si solar cells as well as an approach to achieving the necessary repeatability of fabricating a simulated a:Si reference cell from crystalline silicon photodiodes. Author

N85-19525*# Kentucky Univ., Lexington.
STRESS-STRAIN ANALYSIS OF SILICON RIBBON
O. W. Dillon, Jr. 1 Feb. 1985 11 p Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-956571)
(NASA-CR-175459; DOE/JPL-956571-1; JPL-9950-998; NAS 1.26:175459) Avail: NTIS HC A02/MF A01 CSCL 10A

Temperature profiles for silicon ribbon are presented. Ribbon dislocations and elastic stress are discussed. Ribbon quality is important for the ribbon's function as a solar cell. R.S.F.

N85-19526*# Purdue Univ., Lafayette, Ind. Lab. for Electroceramics.
MOD SILVER METALLIZATION FOR PPHOTOVOLTAICS Quarterly Technical Report, 1 Sep. - 30 Nov. 1984
G. M. Vest and R. W. Vest 21 Dec. 1984 35 p Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956697)
(NASA-CR-175460; DOE/JPL-956679-84/4; JPL-9950-999; NAS 1.26:175460) Avail: NTIS HC A03/MF A01 CSCL 10A

Photovoltaic cells require back side metallization and a collector grid system on the front surface. Both front and back surface metallizations should have good adhesion, low contact resistance, low sheet resistance, long term stability, and their deposition methods should not degrade the n-p junction. Advantages and disadvantages of different deposition methods are discussed. B.G.

N85-19527*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
SOLAR THERMOCHEMICAL PROCESS INTERFACE STUDY Final Report
Feb. 1984 125 p Sponsored by NASA and DOE Prepared for JPL, Pasadena, Calif.
(Contract JPL-956510)
(NASA-CR-174442; JPL-9950-957; NAS 1.26:174442; WAESD-TR-83-1011) Avail: NTIS HC A06/MF A01 CSCL 10A

The design and analyses of a subsystem of a hydrogen production process are described. The process is based on solar driven thermochemical reactions. The subject subsystem receives sulfuric acid of 60% concentration at 100 C, 1 atm pressure. The acid is further concentrated, vaporized, and decomposed (at a rate of 122 g moles/sec H2SO4) into SO2, O2, and water. The produce stream is cooled to 100 C. Three subsystem options, each being driven by direct solar energy, were designed and analyzed. The results are compared with a prior study case in which solar energy was provided indirectly through a helium loop. Author

N85-19528# Westinghouse Electric Corp., Lima, Ohio. Electrical Systems Div.
5 kW SLEEPS INVERTER. REVISION Final Technical Report
D. W. Shireman, I. J. Millman, and C. L. Doughman Nov. 1984 24 p
(Contract DAAK70-79-C-0149)
(AD-A149526) Avail: NTIS HC A02/MF A01 CSCL 10/2

The objective of this program was to develop a preprototype 5 kW inverter capable of operating from a fuel cell source of 36 to 60 volts DC. The output characteristics of the inverter are selectable for the following configuration; single-phase 120 volts AC, split-phase 120/140 volts AC, and three-phase 120/208 volts AC. The output frequency may be either 60 Hz or 400 Hz. The effort has resulted in a preprototype unit capable of supplying the required output voltages, frequencies, and current. The preprototype consists of two packages, the inverter and remote control head with interconnecting cable. GRA

N85-19529# Department of the Air Force, Washington, D.C.
MASK ALIGNER FOR SOLAR CELL FABRICATION Patent Application
D. K. Hufford, inventor (to Air Force) Filed 16 May 1984 11 p
(AD-D011450; US-Patent-Appl-SN-610911) Avail: NTIS HC A02/MF A01 CSCL 10/2

A novel method and device for accurately aligning a substrate comprising a silicon wafer in the fabrication of a silicon vertical junction solar cell are described which comprise a base plate having a recess therein defining an opening for snugly receiving the wafer, the recess including a substantially straight portion for mating with a cleaved edge of known crystallographic orientation provided on the wafer, and a mask plate for covering the base plate and wafer, the mask including a pattern in predetermined configuration through which the wafer may be exposed in the fabrication process for the solar cell. Author (GRA)

N85-19530# Michigan Technological Univ., Houghton. Dept. of Electrical Engineering.
ANALYSIS OF INVERTER MODELS AND HARMONIC PROPAGATION. PART 3. TRANSIENT PROCESSES IN INVERTER MODELS
M. A. Slonim and E. K. Stanek Sep. 1984 67 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000191; SAND-83-7040-Pt-3) Avail: NTIS HC A04/MF A01

Transient processes that arise in the photovoltaic power system during its normal commutational operations were studied. A general description of the transient processes problem and the method of analysis is presented. The transient processes in the inverter model with an inductive filter are analyzed for both the discontinuous and the continuous currents on the dc side of the inverter, and the problem of transient processes due to the change in illumination level is discussed. Transient processes in the inverter model with capacitive filter are analyzed with special emphasis on the process that arises in the photovoltaic power system immediately after the first ignition of the thyristors. The influence of the operating point of the solar cell array on the transient process is discussed. DOE

N85-19531# National Bureau of Standards, Washington, D.C. Center for Building Technology.
MEASUREMENT TECHNIQUES FOR EVALUATING SOLAR

REFLECTOR MATERIALS
Joseph C. Richmond Sep. 1984 72 p refs
(Contract DE-AI01-76PR-06010)
(DE85-002194; NBS-GCR-84-475) Avail: NTIS HC A04/MF A01

Solar reflector materials are used to concentrate the terrestrial solar irradiance on a solar receiver in order to increase the temperature of the working fluid in a solar energy system. To ensure acceptable performance and service life of the materials used in reflectors, data must be available prior to the design, construction and use of reflectors. These data must be generated by reliable measurement techniques. The current state-of-the-art of technology associated with the manufacture and evaluation of solar reflector materials is assessed. An identification of numerous research needs and a bibliography of 124 relevant documents are given. DOE

N85-19532# Argonne National Lab., Ill.
CONCEPTUAL DESIGN OF A 10 MW SHORE-BASED OTEC PLANT
H. C. Stevens, L. Genens, and C. Panchal 1984 7 p refs Presented at the ASME Winter Ann. Meeting, New Orleans, 9 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-015808; CONF-841201-13) Avail: NTIS HC A02/MF A01

A 1982 study of a 10 MWe shore-based closed-cycle ocean thermal energy conversion (OTFC) plant at Keahole Point, Hawaii, is updated to reflect advances in technology that have occurred over the past two years. Design options that show promise for reducing the capital cost of the plant are presented. The options studied include the heat exchangers, the number and size of the cold-water pipes (CWP), the materials and method of construction of the CWP, deployment technique. In all cases, the new options are within modest extrapolations of the current state of the art. Thermal-hydraulic optimization codes were developed and used to upgrade and improve the design, and to focus on those components where significant cost reductions are possible. The power system was improved with more cost-effective heat exchangers and a more water-efficient design. An advanced cold-water pipe option was selected that uses compact, brazed-aluminum heat exchangers. Options for parallel or bundled pipes of smaller (2 meter) diameter were reviewed. It was found that the smaller diameters present fewer fabrication problems, and potentially simpler deployment methods. Also studied were various options for CWP materials and construction. DOE

N85-19533# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
SSPS-CRS ADVANCED SODIUM RECEIVER: CONSTRUCTION EXPERIENCE REPORT
John Hansen Sep. 1984 63 p refs
(Contract DE-AC04-76DR-00789)
(DE85-000825; DOE/DR-00789/T9) Avail: NTIS HC A04/MF A01

The Advanced Sodium Receiver (ASR) is intended to explore the potential of sodium as a heat transfer medium. The principal objectives are to test the behavior of the ASR for at least six months and to enable the central receiver plant of the SSPS project to run at higher heat fluxes and/or higher material and sodium temperatures. The experiences from the design, manufacturing, assembling, and acceptance testing of the ASR are reported. DOE

N85-19534# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
POST STALL AIRFOIL DATA FOR WIND TURBINES: WIND TUNNEL TEST RESULTS
C. Ostowari and D. Naik Jul. 1984 183 p refs Prepared for Rockwell International Corp., Golden, Colo.
(Contract DE-AC04-76DP-03533)
(DE85-004052; RFP-3724) Avail: NTIS HC A09/MF A01

Results of the wind tunnel investigation of constant chord blades having four aspect ratios, with NACA 44XX series airfoil sections, at angles of attack ranging from -10 to 110(0) arre discussed. Tests were conducted at Reynolds number ranging from one-quarter million to one million. The thickness ratios studied were 0.18, 0.15, 0.12 and 0.09. The aspect ratios were 6, 9, 12 and infinity. Results of force and pitching moment measurements, over the angle of attack range, for all combinations of Reynolds numbers, thickness and aspect ratios, and the effect of boundary layer tripping, are presented. Both initial and secondary stall are presented. The maximum drag coefficient is found to occur at an angle of attack of 90(0). The pitching moment is unstable beyond stall. The lift and post-stall drag coefficients decrease with decreasing aspect ratio. The lift coefficient decreases with decreasing thickness ratio, while the drag coefficient increases. The boundary layer tripping is observed to decrease the lift curve slope and stalling angle of attack. The drag coefficient (with tripping) is significantly affected only at low aspect ratio. DOE

N85-19535# Rockwell International Corp., Golden, Colo. Energy Systems Group.
ROCKY FLATS WIND ENERGY RESEARCH CENTER FY 1983 REPORT Annual Report
1983 73 p
(Contract DE-AC04-76DP-03533)
(DE85-004500; RFP-3725) Avail: NTIS HC A04/MF A01

The Fy 1983 Annual Report for the Rocky Flats Wind Energy Research Center describes the technical and programmatic objectives, achievements, and planes for the reporting period October 1, 1982 to September 30, 1983. The research center, operated for the US Department of Energy by the Rockwell International Energy Systems Group, is a major focal point for research and testing of wind systems. Primary activities described include industry-funded and cooperative testing and analysis projects, as well as research projects in the areas of aerodynamics, structural statics and dynamics, power subsystems, and systems integration. Aerodynamic performance and load prediction codes, airfoil development and testing, conclusion of a dynamic stall investigation, and the conduct of an aerodynamics specialists workshop. Activities in the structures disciplines involved the development and validation of simple and complex structural codes, preliminary investigations of fatigue and its prediction, and an analytical study of yaw stability. Focus of power subsystems research was on the atmospheric testing of a variable speed, constant frequency generator system, with some preliminary exploration of advanced power train dynamics research. DOE

N85-19536# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
US AMORPHOUS SILICON RESEARCH PROJECT
E. Sabisky Nov. 1984 6 p Presented at the 1st Intern. Photovoltaic Sci. and Eng. Conf. and Exhibition, Kobe, Japan, 13 Nov. 1984
(Contract DE-AC02-83CH-10093)
(DE85-000536; SERI/TP-211-2520; CONF-841129-4) Avail: NTIS HC A02/MF A01

The US Department of Energy (DOE) established the Amorphous Silicon Research Project (ASRP) in 1983 at the Solar Energy Research Institute (SERI). The ASRP was given the responsibility for developing an Amorphous Silicon Research Plan. A summary of this research plan is presented. DOE

N85-19537# San Bernardino West Side Community Development Corp., Calif.
THE 35 KILOWATT PEAK POWER PHOTOVOLTAIC SYSTEM Final Report
D. Burgess, G. Katz, M. Stary, and E. Zahigian, Jr. Sep. 1984 78 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000189; SAND-81-7035/2) Avail: NTIS HC A05/MF A01

An operational history of a 35 kW peak power photovoltaic system installed by the San Bernardino West Side Community Development Center is described. A description of the major problems encountered and the lessons learned are also included. DOE

N85-19538# Research Triangle Inst., Research Triangle Park, N.C.
STUDY OF LOW ENERGY DENSITY PHOTOVOLTAIC APPLICATIONS UNDER VARYING RATE STRUCTURES
C. D. Parker Sep. 1984 202 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000185; SAND-83-7074) Avail: NTIS HC A10/MF A01

A study to identify and rank low energy density photovoltaic applications and to do detailed analyses and tradeoff studies of the best applications was completed. Low energy density applications are those with peak power requirements of 60 Wp/sq m of floor space, or less, and a commensurate total daytime energy consumption. Four locations for the PV applications, one to represent each of the four geographic regions of the United States were specified. Existing energy consumption data bases and building inventories were studied to identify and rank low energy density applications. Four applications were identified; a branch bank, a day care center, an automotive service center, and distributor warehouse. The 16 application/site pairs were examined. Conceptual designs were generated for each and hour-by-hour energy requirements for typical year for each application/site pair were determined. A PV system was specified for each building at each site, and the performance of each PV system in meeting the building load in the same typical year was determined. The economics of each application was evaluated for a range of on and off peak rates for backup energy and for a range of sellback ratios. DOE

N85-19539# Sandia Labs., Albuquerque, N. Mex.
OVERVIEW OF PHOTOVOLTAIC CONCENTRATOR TECHNOLOGY
D. E. Arvizu and M. W. Edenburn 1984 9 p refs
(Contract DE-AC04-76DP-00789)
(DE84-016790; SAND-84-034C) Avail: NTIS HC A02/MF A01

Concentrator photovoltaics is one of several photovoltaic approaches that could, in the future, provide reliable commercial electric power at a cost competitive with conventional sources. Since the path to providing cost competitive energy is dependent on both the conversion efficiency of the system and its installed cost, concentrators feature a unique approach in that both of these areas are pursued simultaneously. Concentrator technology has been supported by the US Department of Energy's Federal Program for nearly a decade. In that time several systems have been fielded and research has continued to push the development of high efficiency systems. The current status of concentrator photovoltaic technology is discussed. DOE

N85-19540# Washington State Energy Office, Olympia.
SOLAR COLLECTION
S. I. Cole Aug. 1984 48 p refs
(DE85-000060; WAOENG-84-42) Avail: NTIS HC A03/MF A01

Solar dishes, photovoltaics, passive solar building and solar hot water systems, Trombe walls, hot air panels, hybrid solar heating systems, solar grain dryers, solar greenhouses, solar hot water workshops, and solar workshops are discussed. These solar technologies are applied to residential situations. DOE

N85-19541# National Bureau of Standards, Gaithersburg, Md. Center for Building Technology.
MEASUREMENT TECHNIQUES FOR EVALUATING SOLAR REFLECTOR MATERIALS Final Report
J. C. Richmond Sep. 1984 74 p refs Sponsored in part by DOE
(PB85-119469; NBS/GCR-84/475) Avail: NTIS HC A04/MF A01 CSCL 10A

Solar reflector materials are used to concentrate the terrestrial solar irradiance on a solar receiver in order to increase the temperature of the working fluid in a solar energy system. To ensure acceptable performance and service life of the materials used in reflectors, data must be available prior to the design, construction and use of reflectors. These data must be generated by reliable measurement techniques. The current state-of-the-art of technology associated with the manufacture and evaluation of solar reflector materials is assessed. An identification of numerous research needs and a bibliography of 124 relevant documents are given. GRA

N85-19542# Hawaiian Dredging and Construction Co., Honolulu.
OTEC (OCEAN THERMAL ENERGY CONVERSION) COLD WATER PIPE AT-SEA TEST PROGRAM. PHASE 2: SUSPENDED PIPE TEST Final Report
F. A. McHale Aug. 1984 148 p refs
(Contract NA81-SAC-00728)
(PB85-119931) Avail: NTIS HC A07/MF A01 CSCL 10B

An important step in the development of technology for Ocean Thermal Energy Conversion (OTEC) cold water pipes (CWP) is the at-sea testing and subsequent evaluation of a large diameter fiberglass reinforced plastic (FRP) pipe. Focus was on the CWP since it is the most critical element in any OTEC design. The results of the second phase of the CWP At-Sea Test Program are given. During this phase an 8 foot diameter, 400 foot long sandwich wall FRP syntactic foam configuration CWP test article was developed, constructed, deployed and used for data acquisition in the open ocean near Honolulu, Hawaii. This instrumented CWP as suspended from a moored platform for a three week experiment in April-May, 1983. The CWP represented a scaled version of a 40 megawatt size structure, nominally 30 feet in diameter and 3000 feet long. Author (GRA)

N85-19543# Acurex Solar Corp., Mountain View, Calif.
DEVELOPMENT OF MASS-PRODUCIBLE LINE-FOCUS TRACKING CONCENTRATING SOLAR COLLECTORS. CATEGORY 2: TRACKERS
R. J. Carlton Oct. 1984 33 p refs
(Contract DE-FC04-80CS-30599)
(DE85-002673; DOE/CS-30599/T2) Avail: NTIS HC A03/MF A01

The design and construction of the third generation mass-producible tracker system for line-focus concentrating solar collectors has been completed and has performed well in testing and use at the Modular Industrial Solar Retrofit (MISR). The design incorporates high tracking accuracy and smart response to varying insolation and operational conditions, allows a low-cost tracking and control system, and provides high collector system performance. The tracker system consists of the tracker controller (a tracker head) and interconnecting cable. The tracker controller is in a single enclosure and employs a light band photodiode system as the primary tracking method. Other related elements not part of the tracker system itself are the drive motor, group control box, master controller and Solar Tracking Angles Reference. Key aspects of these elements are described herein to provide a complete description of the tracker function and its interactions. This report presents the tracker design requirements, the basic design and functional description, a detailed component description, and production planning comments. DOE

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-19544*# National Aeronautics and Space Administration, Washington, D. C.
CONSTRUCTION AND APPLICATION OF A QUESTIONNAIRE FOR THE SOCIAL SCIENTIFIC INVESTIGATION OF ENVIRONMENTAL NOISE EFFECTS
R. Guski, U. Wichmann, B. Rohrmann, and H. O. Finke May 1980 29 p refs Transl. into ENGLISH from Z. fuer Sozialpsychol. (West Germany), v. 9, 1978 p 50-65 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75492; NAS 1.15:75492) Avail: NTIS HC A03/MF A01 CSCL 13B

A social psychological questionnair has been developed to

study the effects of environmental noise and was applied to 636 people living in 19 different areas of Hamburg. The theoretical foundations and the statistical means employed in its development are described. Four main reactions to noise are isolated statistically, and it is determined that these are moderated by several intervening variables, chief of which are coping capacity for noise, the perceived dangerousness of the noise souce, other daily loads and the individual's liability. Author

N85-19545# Brookhaven National Lab., Upton, N. Y. Atmospheric Sciences Div.
SEQUENTIAL PRECIPITATION CHEMISTRY SAMPLING PROGRAM AT BROOKHAVEN NATIONAL LABORATORY WITH AN ANALYTICAL SUMMARY OF 1976-1982 DATA
Gilbert S. Raynor and Janet V. Hayes Jul. 1984 76 p refs
(Contract DE-AC02-76CH-00016)
(DE85-002788; BNL-51819) Avail: NTIS HC A05/MF A01

Hourly precipitation samples were collected with the Brookhaven automatic sequential precipitation sampler. Conventional meteorological data and the synoptic conditions causing the precipitation were recorded for each hourly sample period. The samples were analyzed for pH, conductivity, and concentrations of sulfate, nitrate, ammonium, sodium, and chloride ions until October 1982 and for only pH and conductivity thereafter. Data from a 6 year period when completed chemical measurements were performed were analyzed. Ratios of selected ions and excess sulfate were calculated and treated as additional variables. Statistical analyses were performed of the relationships between selected chemical variables and between them and meteorological conditions. Precipitation rate and precipitation amount were also analyzed for other meteorological variables. The results, are given for each year separately for unclassified data and for the 6 years jointly for data classified by meteorological and synoptic conditions. Annual means of ionic concentrations for the 5 calendar years within the 6 year period are also given for comparison with annual data from other stations. DOE

N85-19546# Radian Corp., Austin, Tex.
NON-PHOTOCHEMICAL INTERACTIONS OF SULFUR AND NITROGEN COMPOUNDS IN ACID DEPOSITION Final Report
L. O. Edwards, F. B. Meserole, R. L. Leonard, and T. A. Hall 22 Aug. 1984 67 p refs
(Contract DE-AC01-82EP-12086)
(DE84-016141; DOE/EP-12086/T6) Avail: NTIS HC A04/MF A01

Radian scientists suggest that, the direct reaction of SO2 and NO2 in rain and cloud water could be an important factor in their oxidation under low light conditions. Information pertaining to the potential of the sulfite-nitrite mechanism is presented. An analysis of the impact that this chemistry would have on policy regarding control strategies and future research is also presented. Finding that sulfite-nitrite reactions do, at times, account for a substantial portion of SO2 oxidation will: (1) provide an improved understanding of nonphotochemical oxidation mechanism; (2) introduce a new set of compounds to consider in the study of toxic effects of acid deposition; (3) improve accuracy of atmospheric models; and (4) effect regional emission control strategies based on identifying and reducing the limiting reactant. DOE

N85-19547# Pacific Northwest Lab., Richland, Wash.
TRAN-STAT: STATISTICS FOR ENVIRONMENTAL STUDIES
Richard O. Gilbert Sep. 1984 36 p refs
(Contract DE-AC06-76RL-01830)
(DE85-000829; PNL-SA-12523) Avail: NTIS HC A03/MF A01

Statistical methods for assessing the uncertainty in predictions of pollutant transport models, particularly for radionuclides are discussed. Emphasis is placed on radionuclide transport models but the statistical assessment techniques also apply in general to other types of pollutants. The report begins with an outline of why an assessment of prediction uncertainties is important. This is followed by an introduction to several methods currently used in these assessments. This in turn is followed by more detailed discussion of the methods, including examples. DOE

N85-19548# Ecological Research Associates, San Diego, Calif.
REMOVAL OF HEAVY METALS BY ARTIFICIAL WETLANDS Final Report, 17 Mar. 1982 - 16 Mar. 1983
Richard H. Gersberg, Stephen R. Lyon, Bert V. Elkins (San Diego Region Water Reclamation Agency, Santee, Calif.), and Charles R. Goldman (California Univ., Davis) Oct. 1984 13 p refs Sponsored by EPA
(PB85-116127; EPA/600-D-84-258) Avail: NTIS HC A02/MF A01 CSCL 13B

Artificial wetlands were operated successfully for treatment of municipal wastewater for a number of years at several locations in this country. However, the capability of these systems to treat heavy metal laden municipal wastewater was not previously investigated. The artifical wetland system at Santee, California which is normally used for polishing secondary municipal wastewater was evaluated for treatment of cadmium, zinc and copper. These metals were added to the influent waste stream in high concentrations during a one-year study and wetland effluent was tested to determine their removal efficiency. Their removal efficiency ranged from an average of 97 percent for zinc to over 99 percent for the two other metals. GRA

N85-19549# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Monitoring Systems Lab.
APPLICATION OF SIMCA (SOFT INDEPENDENT MODELING OF CLASS ANALOGY) PATTERN RECOGNITION TO AIR POLLUTANT ANALYTICAL DATA
D. R. Scott Nov. 1984 41 p refs
(PB85-124683; EPA/600-D-84/271) Avail: NTIS HC A03/MF A01 CSCL 07D

The SIMCA 3B computer program is a modular, graphics oriented pattern recognition package which can be run on a microcomputer with limited memory, e.g., an Osborne 1 with 64K memory. Principal component analysis is used to classify data with this program. The SIMCA program was used to display small analytical data sets for exploratory data analysis after principal component fitting. K-Nearest Neighbor distances were also computed. The data sets included an interlaboratory comparison of trace element analyses of particulates by X-ray emission; a comparison of two methods for analyzing lead in gasoline; and GC/MS analysis of volatile organic compounds in ambient air. A combination of principal component and K-Nearest Neighbor analysis was found to provide a convenient and quick method for detecting outliers in the data sets. Author (GRA)

N85-19453# Joint Publications Research Service, Arlington, Va.
CALCULATION OF OPTICAL CHARACTERISTICS OF SHELF ECOLOGICAL SYSTEM BASED ON ITS MATHEMATICAL MODEL Abstract Only
V. I. Belyayev and M. G. Poplavskaya *In its* USSR Rep: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 21 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 6, Aug. 1984 p 1345-1347 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19454# Joint Publications Research Service, Arlington, Va.
INTRUSION OF RADIOACTIVE INDUSTRIALLY POLLUTED WATER FROM NORTH SEA INTO CENTRAL BALTIC SEA Abstract Only
S. M. Vakulovskiy and A. I. Nikitin *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 21 Transl. into ENGLISH from At. Energ. (Moscow), no. 3, Sep. 1984 p 186-188 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19465# Joint Publications Research Service, Arlington, Va.
LASER AIR POLLUTION MONITORING SYSTEM PLANNED FOR MOSCOW Abstract Only
In its USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 28-29 Transl. into ENGLISH from Moskovskaya Pravda (Moscow), 1 Dec. 1984 p 3 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-19550*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRBORNE LIDAR MEASUREMENTS OF EL CHICHON STRATOSPHERIC AEROSOLS, OCTOBER 1982 TO NOVEMBER 1982
M. Patrick McCormick and M. T. Osborn (Systems and Applied Sciences Corp.) Feb. 1985 120 p refs
(NASA-RP-1136; L-15904; NAS 1.61:1136) Avail: NTIS HC A06/MF A01 CSCL 04A

A coordinated flight mission to determine the spatial distribution and aerosol characteristics of the El Chichon produced stratospheric aerosol was flown in October to November 1982. The mission covered 46 deg N to 46 deg S and included rendezvous between balloon-, airplane-, and satellite-borne sensors. The lidar data from the flight mission are presented. Representative profiles of lidar backscatter ratio, plots of the integrated backscattering function versus latitude, and contours of backscatter mixing ratio versus altitude and latitude are given. In addition, tables containing numerical values of the backscatter ratio and backscattering functions versus altitude are supplied for each profile. The bulk of the material produced by the El Chichon eruptions of late March 10 to early April 1982 resided between latitudes from 5 to 7 deg S to 35 to 37 deg N and was concentrated above 21 km in a layer that peaked at 23 to 25 km. In this latitude region, peak scattering ratios at a wavelength of 0.6943 micron were approximately 24. The results of this mission are presented in a ready-to-use format for atmospheric and climatic studies. Author

N85-19551*# National Aeronautics and Space Administration, Washington, D. C.
STUDY OF THE PHYSICAL PROPERTIES OF CRYSTALLINE ROCKS IN THE SOUTHEAST VORONEZH ANTECLISE
V. S. Dmitriyevskiy, N. S. Afanasyev, and S. M. Frolov Feb. 1985 12 p refs Transl. into ENGLISH from Geol. Sb. (USSR), v. 66, 1968 p 247-253 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77823; NAS 1.15:77823) Avail: NTIS HC A02/MF A01 CSCL 08G

The physical properties of rocks, in the crystalline mass of the Voronezh anteclise, were studied. The study of the physical properties of rocks is important for the improvement of geophysical methods for mapping crystalline rocks in the foundation and exploration of different geological objects which are associated with the crystalline foundation, covered by the sedimentary mantle. It is found that: (1) rocks in the crystalline foundation are very different in physical properties; (2) the physical properties are closely related to their substance composition and genesis; (3) petrographic properties give clues of rock affiliation to certain complexes; and (4) physical and magnetic properties should be examined by petrography, chemical and X-ray analysis. E.A.K.

N85-19552*# National Aeronautics and Space Administration, Washington, D. C.
GEOLOGICAL REASONS FOR CHANGE IN INTENSITY OF LINEAR MAGNETIC ANOMALIES OF THE KURSK MAGNETIC ANOMALY
I. A. Zhavoronkin and V. V. Kopayev Feb. 1985 16 p refs Transl. into ENGLISH from Geol. Sb. (USSR), v. 66, 1968 p 238-246 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77824; NAS 1.15:77824) Avail: NTIS HC A02/MF A01 CSCL 08G

The geological reasons for fluctuations in the anomalous field intensity along the polar axes were examined. The Kursk magnetic anomaly is used as the basis for the study. A geological-geophysical section was constructed which used the results of the interpretation of gravimagnetic anomalies. E.A.K.

N85-19553# Lockheed Missiles and Space Co., Palo Alto, Calif.
CO-INVESTIGATOR PARTICIPATION ON THE ION MASS SPECTROMETER FOR THE GIOTTO MISSION TO COMET HALLEY Monthly Progress Report, period ending 31 Aug. 1984
E. G. Shelley 31 Aug. 1984 15 p refs
(Contract NASw-3729)
(LMSC/F018805) Avail: NTIS HC A02/MF A01

The first year of sodium nightglow observations from Natal are examined. Time variations appear to follow a pattern of their own, different from low latitude results. The major seasonal peak occurs in September to October and the average variation during the night decreases from dusk to dawn. Statistics on cloud coverage show that Natal has roughly only about 3 clear hours per night. The best observing period is April with an average of 5 clear hours per night. Author

N85-19554# Danish Space Research Inst., Lyngby.
PARTIAL PENETRATION OF IMF B(SUB y) INTO THE MAGNETOSPHERE
F. Primdahl Nov. 1984 13 p refs
(DRI-5-84; ISSN-0109-6605) Avail: NTIS HC A02/MF A01

Recent observations of partial penetration of the IMF B sub y into the magnetosphere are shown to agree well with the idea of a magnetopause current K sub y induced by IMF B sub y. The slow decay of K sub y caused by Joule heat losses in the Cusp ionospheres is responsible for the appearance of a fraction of IMF B sub y inside the magnetosphere, and this also explains the large statistical scatter of the data. A decay time constant of 4 to 5 days is derived from the average fraction of IMF observed inside the magnetosphere in good agreement with the 7 day time constant previously proposed. Author

N85-19555# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RECENT INVESTIGATIONS AT INPE IN MAGNETOSPHERIC PHYSICS AND GEOMAGNETISM
W. D. Gonzalez and N. B. Trivedi Sep. 1984 9 p refs Presented at the Symp. Nipo-Brasil., Sao Paulo, Brazil, Jul. 1984 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3280-PRE/603) Avail: NTIS HC A02/MF A01

During recent years the following research activities related to the Earth's magnetosphere were intensified: (1) studies on electric field and energy transfer from the solar wind to the magnetosphere; (2) studies on high latitude magnetospheric electric fields and on their penetration into the plasmasphere; (3) measurements of atmospheric-large scale-electric fields, related to the low latitude magnetospheric-ionospheric coupling and to the local atmospheric electrodynamics, using detectors on boarad stratospheric balloons; and (4) measurements of atmospheric X-rays, related to the process of energetic particle precipitation at the South Atlantic magnetic anomaly, using detectors also on board stratospheric balloons. Similarly, the following research activities related to geomagnetism are being pursued: studies on the variability of the geomagnetic field and on the dynamics of the equatorial eletrojet from local geomagnetic field measurements; studies on terrestrial electromagnetic induction through local measurements of the geo-electromagnetic field; and studies on the influence of geomagnetic activity on particle precipitation at the South Atlantic magnetic anomaly. Author

N85-19556# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IONOSPHERIC RESEARCH AT INPE
M. A. Abdu Sep. 1984 17 p refs Presented at the Symp. Nipo-Brasil., Sao Paulo, Brazil, Jul. 1984 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3279-PRE/602) Avail: NTIS HC A02/MF A01

Ionospheric investigations at INPE are mainly concerned with the problems of equatorial and tropical ionospheres and their electrodynamic coupling with the high latitude ionosphere. Present research objectives include investigations in the following specific areas: equatorial ionospheric plasma dynamics; plasma irregularity generation and morphology, and effects on spaceborne radar operations; ionospheric response to disturbance dynamo and magnetospheric fields; aeronomic effects of charged particle precipitation in the magnetic anomaly, etc. These problems are being investigated using experimental data collected from ionospheric diagnostic instruments being operated at different locations in Brazil. These instruments are: ionosondes, VHF electronic polarimeters, L-band scintillation receivers, airglow photometers, riometers, and VLF receivers. A brief summary of the research activities and some recent results is presented. Author

N85-19557# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil). Dept. of Geophysics and Aeronomy.
UPPER ATMOSPHERE RESEARCH AT INPE
B. R. Clemesha Sep. 1984 15 p refs Presented at the Symp. Nipo-Brasil., Sao Paulo, Brazil, Jul. 1984 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3281-PRE/604) Avail: NTIS HC A02/MF A01

Upper atmosphere research at INPE is mainly concerned with the chemistry and dynamics of the stratosphere, upper mesosphere and lower thermosphere, and the middle thermosphere. Experimental work includes lidar observations of the stratospheric aerosol, measurements of stratospheric ozone by Dobson spectrophotometers and by balloon and rocket borne sondes, lidar measurements of atmospheric sodium, and photometric observations of O, O2, OH, and Na emissions, including interferometric measurements of the OI6300 emission for the purpose of determining thermospheric winds and temperature. The airglow observations also include measurements of a number of emissions produced by the precipitation of energetic neutral particles generated by charge exchange in the ring current. Some recent results of INPE's upper atmosphere program are presented. Author

N85-19558# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
U, Th, K CONTENT, HEAT PRODUCTION AND THERMAL CONDUCTIVITY OF SAO PAULO, BRAZIL CONTINENTAL SHELF SEDIMENTS: A RECONNAISSANCE WORK
E. B. Pereira, V. M. Hamza (Inst. Astronomico e Geofisiso USP, Sao Paulo, Brazil), V. V. Furtado (Inst. Oceanografico USP, Sao Paulo, Brazil), and J. A. S. Adams (Rice Univ.) Jan. 1985 22 p refs Submitted for publication Sponsored in part by Conselho Nacional de Pesquisas, Fundo Nacional de Desenvolvimento Cientifico e Tecnologico, and the Welch Foundation
(INPE-3401-PRE/670) Avail: NTIS HC A02/MF A01

A reconnaissance of the natural potassium, uranium and thorium content, the radiogenic heat production, and the thermal conductivity of 80 bottom surface sediment samples collected in the Brazilian continental shelf off Sao Paulo was made. The average equivalent contents of these radioelements in an estuarine ambient were 1.21%, 1.75 ppm, and 4.29 ppm respectively, and 1.20%, 1.21 ppm, and 4.05 ppm respectively in the shelf samples. The U-234 to U-238 isotopic ratios varied from 0.60 to 1.75 with an average of 1.11, indicating that the sources for the uranium in these sediments are both terrigenous and from the sea water. An average radiogenic heat production of 0.63 + or - 0.04 micro W/cu m was calculated from the experimental concentration data. Data for the thermal conductivity measurements ranged from 0.83 to 2.51 micro W/m/deg C, with an average of 1.81 micro W/m/deg C. Author

N85-19559# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BRAZIL FUTURE PLANS IN UPPER ATMOSPHERE RESEARCH IN ANTARCTICA
P. Kaufmann Jan. 1985 6 p Presented at SCAR Workshop, Bremerhaven, West Germany, Sep. 1984 Submitted for publication
(INPE-3400-PRE/669) Avail: NTIS HC A02/MF A01

Future upper atmosphere research projected in Antarctica, related to geomagnetism and geoelectricity, upper ionosphere sounding and absorption studies, VLF propagation and low ionosphere physics, and on X-rays, gamma rays, and particle precipitation phenomena analyzed by detectors carried by balloons and rockets are summarized. Author

N85-19560# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FIRST SODIUM NIGHTGLOW RESULTS FOR NATAL
V. W. J. H. Kirchhoff and H. Takahashi Jan. 1985 15 p refs Submitted for publication
(INPE-3397-PRE/666) Avail: NTIS HC A02/MF A01

The first year of sodium nightglow observations from Natal are examined. Time variations appear to follow a pattern of their own, different from low latitude results. The major seasonal peak occurs in September to October and the average variation during the night decreases from dusk to dawn. Statistics on cloud coverage show that Natal has roughly only about 3 clear hours per night. The best observing period is April with an average of 5 clear hours per night. Author

N85-19561# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SOME ASPECTS OF ATMOSPHERIC CIRCULATION NEAR SOUTH AMERICA AND INTERACTIONS WITH THE ANTARCTIC REGIONS [ALGUNS ASPECTOS DA CIRCULACAO DA ATMOSFERA PROXIMA A AMERICA DO SUL E INTERACOES COM A REGIAO ANTARTICA]
Iracema F. A. Cavalcanti Oct. 1984 85 p refs In PORTUGUESE; ENGLISH summary Presented at the Workshop Patrocinado pela CIRM (Comissao Interministerial para Recursos do Mar) - PROANTAR (Programa Antartico Brasileiro)
(INPE-3308-PRE/618) Avail: NTIS HC A05/MF A01

Global features of circulation and outgoing long wave radiation are obtained by eigenvector analysis (Empirical Orthogonal Functions Method). The eigenvector patterns are related to synoptic situations that affect South America. Surface data from Antarctica are related to lower latitude circulation and suggest an interaction between the two regions. This interaction may have influence on the track of the synoptic systems that affect South America. Author

N85-19562*# National Aeronautics and Space Administration, Washington, D. C.
AEROSOL LIMB ABSORPTION
Jul. 1984 11 p Transl. into ENGLISH from "EXOC-C Satellite, Interim Report" Japan, Jul. 1982 p 29-36 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77733; NAS 1.15:77733) Avail: NTIS HC A02/MF A01 CSCL 04A

A global observation was conducted of the vertical distribution of stratospheric aerosol and ozone using the absorption effect of the rays of the Sun by the stratospheric aerosol and ozone. Author

N85-19563# Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
INFLUENCE OF SCATTERING ON Q IN THE LITHOSPHERE Semiannual Technical Report, 1 Dec. 1983 - 31 May 1984
A. M. Dainty 31 May 1984 30 p
(Grant AF-AFOSR-0037-83; ARPA Order 4397)
(AD-A149318; AFOSR-84-1157TR; SATR-2) Avail: NTIS HC A03/MF A01 CSCL 08/11

Codas of local earthquakes from Monticello Reservoir, South Carolina, and Mammoth Lakes, California, have been examined to determine scattering parameters and attenuation for the crust in these areas. The backscattering turbidity (or backscattering cross-section per unit volume) and the total coda Q have been determined. In both areas, strong scattering is observed in the near surface crust (upper 10 km), sufficiently strong that multiple

scattering is occurring. Because multiple scattering is occurring, coda Q at short times will underestimate Q experienced by a short pulse. At long times, the coda at Monticello indicates the presence of a low-scattering crustal channel within which energy probably spreads horizontally; this channel is either absent or more strongly scattering at Mammoth Lakes. Results at both sites indicate that both in the near surface region and in the aforementioned crustal channel, scattering is probably an important contributor to Q (at least half of the attenuation). The scatterers are probably predominantly forward scattering (such as velocity fluctuations), and in the near surface there are many scatterers of size 50 m and greater. GRA

N85-19564# Rochester Univ., N. Y. Dept. of Chemistry.
INFRARED EXCITATION OF CLUSTERS AND IONS OF ATMOSPHERIC INTEREST Progress Report, 1 Sep. 1983 - 31 Aug. 1984
John S. Muenter 31 Aug. 1984 6 p
(Contract DE-AC02-77EV-04321)
(DE85-002098; DOE/EV-04321/4; COO-4321A-4; PR-1) Avail: NTIS HC A02/MF A01

An infrared color center laser to excite molecular beams of both stable molecules and molecular complexes was used. Excited state electronic structure and dissociation dynamics were obtained. The vibrational predissociation of the hydrogen fluoride dimer following excitation of v sub 1, the hydrogen-fluoride stretch of the protoin accepting monomer, was studied. The extreme difference between the dissociation lifetimes following excitation of the two different H-F stretches in the dimer is established. DOE

N85-19246*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ACCURACY OF RADIO INTERFEROMETRIC MEASUREMENTS OF EARTH ROTATION
T. M. Eubanks, J. A. Steppe, and M. A. Spieth *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 229-235 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 08E

N85-19447# Joint Publications Research Service, Arlington, Va.
SPATIAL DISTRIBUTION OF AURORAS AND ITS RELATIONSHIP TO GEOLOGICAL STRUCTURE OF NORILSK REGION Abstract Only
Yu. K. Krakovetsky, L. N. Popov, I. P. Doronina, and L. M. Chagarov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 7 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 8, Aug. 1984 p 18-23 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19448# Joint Publications Research Service, Arlington, Va.
DECADE OF THE VARILOV KUPOLA Abstract Only
L. S. Govorukha *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 7-8 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow), no. 5, Sep. - Oct. 1984 p 79-82 (For primary document see N85-19446 10-42)
Avail: NTIS HC A4/MF A01

N85-19450# Joint Publications Research Service, Arlington, Va.
MAJOR GLACIATION EVENTS OF THE PAST AND THEIR GEOLOGICAL SIGNIFICANCE Abstract Only
N. M. Chumakov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 10 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geol. (Moscow), no. 7, Jul. 1984 p 35-53 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19451# Joint Publications Research Service, Arlington, Va.
EVOLUTION OF SEDIMENTATION BASINS IN EARTH'S HISTORY Abstract Only
P. P. Timofeyev and V. N. Kholodov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 19 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geol. (Moscow), no. 7, Jul. 1984 p 10-34 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19452# Joint Publications Research Service, Arlington, Va.
TYPES OF PLACER FORMATION OF EASTERN ARCTIC SHELF Abstract Only
Yu. P. Bezrodnykh *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 20 Transl. into ENGLISH from Soverskaya Geol. (Moscow), no. 9, Sep. 1984 p 33-37 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19456# Joint Publications Research Service, Arlington, Va.
NEW DATA ON STRUCTURE OF SHIRSHOV RIDGE (BERING SEA) Abstract Only
Yu. P. Neprochnov, V. V. Sedov, L. R. Merklin, and G. B. Rudnik *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 22-23 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 6, Aug. 1984 p 1459-1463 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19464# Joint Publications Research Service, Arlington, Va.
ORGANOGENIC STRUCTURES (SUBMERGED REEFS) IN SILHETIAN LIMESTONE OF WEST BENGAL BASIN Abstract Only
V. A. Moskvich *In its* USSR Rept: Earth Sci. (JPS-UES-85-003) 11 Feb. 1985 p 27 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geol. (Moscow), no. 9, Sep. 1984 p 102-109 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19467# Joint Publications Research Service, Arlington, Va.
STUDY OF LOWER IONOSPHERE BY PULSE CROSS-MODULATION METHOD Abstract Only
L. F. Chernogor *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 31 Transl. into ENGLISH from Geofiz. Zh. (Kiev), v. 6, no. 5, Sep. - Oct. 1984 p 46-58 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19468# Joint Publications Research Service, Arlington, Va.
CONDENSATIONAL TRANSFORMATION OF ATMOSPHERIC AEROSOL PARTICLE DISTRIBUTION FUNCTIONS Abstract Only
A. G. Laktionov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 31-32 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 6, Aug. 1984 p 1347-1350 Original language document was announced in IAA as A85-11578 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19469# Joint Publications Research Service, Arlington, Va.
EARTHQUAKE-MODELING EXPERIMENT USING UNIQUE PRESS Abstract Only
G. Lamanov *In its* USSR Rept.: Earth ci. (JPRS-UES-85-003) 11 Feb. 1985 p 37 Transl. into ENGLISH from Sots. Industr. (Moscow), 25 Nov. 1984 p 4 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19470# Joint Publications Research Service, Arlington, Va.
LOCALIZATION OF DESTRUCTION PROCESS Abstract Only
V. A. Mukhamedov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 38 Transl. into ENGLISH from Izv. Akad. Nauk Turkmensk. SSR, Ser. Fiz.-Tekhn., Khim. i Geol. Nauk (USSR), no. 2, 1984 p 30-35 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19471# Joint Publications Research Service, Arlington, Va.
VERTICAL MOVEMENTS AND STRUCTURE FORMATION WITHIN ISLAND SYSTEMS OF NORTHEAST ASIA Abstract Only

P. M. Sychev, V. K. Zakharov, and V. P. Semakin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 38-39 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 15-28 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19472# Joint Publications Research Service, Arlington, Va.
BASIC STRUCTURAL FEATURES AND PROBABLE MECHANISM OF FORMATION OF THE KURIL ISLAND SYSTEM Abstract Only
K. F. Sergeyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 39-40 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 29-40 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19473# Joint Publications Research Service, Arlington, Va.
THERMAL CONDITIONS AND THINNING OF LITHOSPHERE IN LATE CENOZOIC IN SOUTHWESTERN US Abstract Only
Yu. A. Zorin, S. V. Lepina, and S. V. Lysak *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 40-41 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 49-59 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19474# Joint Publications Research Service, Arlington, Va.
PROSPECTS AND MEANS FOR DEVELOPMENT OF THEORY AND PRACTICE OF INTERPRETATION OF GRAVITATIONAL AND MAGNETIC ANOMALIES Abstract Only
V. N. Strakhov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 41-42 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 60-70 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19475# Joint Publications Research Service, Arlington, Va.
RELATIONSHIP OF GOLD CONTENT TO GRAVITY FIELDS IN FAR EAST Abstract Only
L. V. Eyrish *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 42 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 94-98 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19476# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODELING OF WAVE FIELDS BY SUPERIMPOSITION OF BOUNDARY WAVES IN REFLECTED EARTHQUAKE WAVES METHOD Abstract Only
M. N. Luneva *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 42-43 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 4, Jul. - Aug. 1984 p 103-114 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19477# Joint Publications Research Service, Arlington, Va.
SOME SPECIFICS OF METHODS FOR MASS DETAILED STUDIES OF ROCK HEAT CONDUCTIVITY Abstract Only
Yu. A. Popov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 43 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Geol. i Razvedka (Moscow), no. 4, Apr. 1984 p 76-84 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19479# Joint Publications Research Service, Arlington, Va.
STUDY OF TECTONIC EARTHQUAKE PRECURSORS BY GEODETIC METHODS Abstract Only
V. M. Sigalov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 46-47 Transl. into ENGLISH from Geod. i Kartografiya (Moscow), no. 8, Aug. 1984 p 39-44 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19480# Joint Publications Research Service, Arlington, Va.
TECTONIC POSITION AND FORMATION OF YOUNG ALKALINE PROVINCES OF CONTINENTS AND OCEANS Abstract Only
V. G. Lazarenkov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 48-49 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geol. (Moscow), no. 7, Jul. 1984 p 84-92 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19481# Joint Publications Research Service, Arlington, Va.
MESOZOIC MAGMATISM OF MONGOLIAN-OKHOTSK BELT AND ITS POSSIBLE GEODYNAMIC INTERPRETATION Abstract Only
V. I. Kovalenko, M. I. Kuzmin, and V. S. Antipin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 49 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geol. (Moscow), no. 7, Jul. 1984 p 93-107 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19482# Joint Publications Research Service, Arlington, Va.
NONLINEAR SEISMOLOGY Abstract Only
I. A. Beresnev and A. V. Nikolayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 50 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 5, Sep. - Oct. 1984 p 56-62 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19483# Joint Publications Research Service, Arlington, Va.
STATISTICAL STUDY OF ANTHROPOGENIC SEISMIC NOISE WITH IVK-7 COMPUTER SYSTEM Abstract Only
B. S. Karryyev, Ye. G. Kanel, I. A. Popova, Ye. G. Stroganoz, and V. V. Tsyplakov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 50-51 Transl. into ENGLISH from Izv. Akad. Nauk Turkmenskoy SSR, Ser. Fiz.-Tekhn., Khim. i Geol. Nauk (USSR), no. 3, 1984 p 39-46 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-19565*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EFFECT OF THE ARBITRARY LEVEL ASSIGNMENT OF SATELLITE CLOUD MOTION WIND VECTORS ON WIND ANALYSES IN THE PRE-THUNDERSTORM ENVIRONMENT
Cynthis A. Peslen, Steven E. Koch, and Louis W. Uccellini Feb. 1985 62 p refs
(NASA-TM-86186; NAS 1.15:86186) Avail: NTIS HC A04/MF A01 CSCL 04B

The impact of satellite-derived cloud motion vectors on SESAME rawinsonde wind fields was studied in two separate cases. The effect of wind and moisture gradients on the arbitrary assignment of the satellite data is assessed to coordinate surfaces in a severe storm environment marked by strong vertical wind shear. Objective analyses of SESAME rawinsonde winds and combined winds are produced and differences between these two analyzed fields are used to make an assessment of coordinate level choice. It is shown that the standard method of arbitrarily assigning wind vectors to a low level coordinate surface yields systematic differences between the rawinsonde and combined wind analyses. Arbitrary assignment of cloud motions to the 0.9 sigma surface produces smaller differences than assignment to the 825 mb pressure surface. Systematic differences occur near moisture discontinuities and in regions of horizontal and vertical wind shears. The differences between the combined and SESAME wind fields are made smallest by vertically interpolating cloud motions to either a pressure or sigma surface. E.A.K.

N85-19566*# Arizona Univ., Tucson. Dept. of Atmospheric Sciences.
COMPUTER STUDIES OF BAROCLINIC FLOW Final Report
Robert Gall [1985] 3 p
(Contract NAS8-33815)
(NASA-CR-171338; NAS 1.26:171338) Avail: NTIS HC A02/MF A01 CSCL 04B

Programs necessary for computing the transition curve on the regime diagram for the atmospheric general circulation experiment (AGOE) were completed and used to determine the regime diagram for the rotating annulus and some axisymmetric flows for one possible AGOE configuration. The effect of geometrical constraints on the size of eddies developing from a basic state is being examined. In AGOE, the geometric constraint should be the width of the shear zone or the baroclinic zone. Linear and nonlinear models are to be used to examine both barotropic and baroclinic flows. The results should help explain the scale selection mechanism of baroclinic eddies in the atmosphere experimental models such as AGOE, and the multiple vortex phenomenon in tornadoes. A.R.H.

N85-19567*# Universities Space Research Association, Boulder, Colo.
CYCLONE DIAGNOSTICS Quarterly Progress Report, 1 Aug. - 31 Oct. 1984
1984 11 p
(Contract NAS8-34010)
(NASA-CR-171337; NAS 1.26:171337) Avail: NTIS HC A02/MF A01 CSCL 04B

A GOES IR rainfall estimation algorithm was completed and verified. The technique was applied to the South Pacific convergent zone. The NASA earth observation mission series is discussed briefly. Backscatter was investigated using 10.6 micron coherent lidar. R.S.F.

N85-19568*# South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
RAIN VOLUME ESTIMATION OVER AREAS USING SATELLITE AND RADAR DATA Semiannual Report, 1 Jul. - 31 Dec. 1984
Andre A. Doneaud and Thomas H. VonderHaar 15 Mar. 1985 25 p
(Grant NAG5-386)
(NASA-CR-174434; NAS 1.26:174434) Avail: NTIS HC A02/MF A01 CSCL 04B

An investigation of the feasibility of rain volume estimation using satellite data following a technique recently developed with radar data called the Arera Time Integral was undertaken. Case studies were selected on the basis of existing radar and satellite data sets which match in space and time. Four multicell clusters were analyzed. Routines for navigation remapping amd smoothing of satellite images were performed. Visible counts were normalized for solar zenith angle. A radar sector of interest was defined to delineate specific radar echo clusters for each radar time throughout the radar echo cluster lifetime. A satellite sector of interest was defined by applying small adjustments to the radar sector using a manual processing technique. The radar echo area, the IR maximum counts and the IR counts matching radar echo areas were found to evolve similarly, except for the decaying phase of the cluster where the cirrus debris keeps the IR counts high. Author

N85-19569# Finnish Meteorological Inst., Helsinki.
A MODEL FOR FORECASTING RUNWAY SURFACE TEMPERATURE AND VERIFICATION WITH SUBJECTIVE FORECASTS
Ossi Korhonen Oct. 1983 27 p refs
(TR-28; ISBN-951-697-197-0; ISSN-0355-1733) Avail: NTIS HC A03/MF A01

One part of the routine work of the METEO at Helsinki-Vantaa airport is forecasting the runway surface temperature. This is done for airport winter maintenance. The results show that runway surface temperature can be forecast quite accurately, the mean error being below 1 C for forecasting periods under 15 hours. Results also favor the use of the model instead of purely subjective forecasting although the differences are small. During the verification test subjective cloud forecasts were also done and results indicate the validity time of about 7 hours for these forecasts. The greatest forecasting errors were related to moving low pressure systems. In these cases, runway surface temperature forecasts can be improved but more advanced methods for forecasting cloudiness and air temperature are needed. Author

N85-19570# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PLANETARY SCALE CIRCULATION ANOMALIES ASSOCIATED WITH DROUGHTS OVER NORTHEAST BRAZIL
Paulo Nobre, A. Divino Moura, and Carlos A. Nobre Nov. 1984 15 p refs Submitted for publication
(INPE-3351-PRE/630) Avail: NTIS HC A02/MF A01

An analysis of the monthly departure of the relative vorticity field and wind over the globe and monthly departures of the Sea Surface Temperature (SST) in the Tropical Atlantic Ocean is performed for drought years and very wet years in Northeast Brazil, in the period from 1963 to 1980. Planetary-scale teleconnection patterns were observed in the vorticity and wind deviation fields, similar to those found in previous theoretical and observational studies. Of major interest is the phase coherence of the wavelike (teleconnection) patterns of circulation anomalies over the Northern Hemisphere in winter (mainly in December-January) and the precipitation regime over Northeast Brazil, that is, the phase of the teleconnection pattern reverses from a very dry to a very wet year. It is known that SST anomalies in the Tropical Atlantic (with warmer waters in the north and colder in the south of the equator for drought years, and the reverse for very wet years) are mostly discernible in February-March, whereas the teleconnections patterns are more clearly visible in December-January. B.W.

N85-19571# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LARGE SCALE CIRCULATION ANOMALIES AND PREDICTION OF NORTHEAST BRAZIL DROUGHTS
Paulo Nobre, Carlos Afonso Nobre, and Antonio Divino Moura Feb. 1985 5 p refs Proposed for presentation at the 16th Conf. on Hurricanes and Trop. Meteorol., Houston, Tex., May 1985
(INPE-3405-PRE/674) Avail: NTIS HC A02/MF A01

An analysis of the monthly departure of the relative vorticity and wind fields over the globe was performed for the period from 1963 to 1980. Planetary-scale wavelike (teleconnection) patterns were observed in the vorticity and wind deviation fields extending from subtropical North Atlantic through the North Pole to eastern Siberia for years of droughts and excessive rainfall over Northeast Brazil (Nordeste). These patterns are sharpest in December to January. Of major interest is the phase coherence of the wavelike patterns and the precipitation anomalies of Nordeste, that is, the phase of the patterns is reversed from very dry to very wet years. Such phase coherence and also the emergence and persistance of the wavelike pattern several months previously to the rainy season in Nordeste (March to May), seems to indicate there might be some predictive potential in these configurations. Author

N85-19572# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MERIDIONAL PENETRATION OF FRONTAL SYSTEMS IN SOUTH AMERICA AND ITS RELATION TO ORGANIZED CONVECTION IN THE AMAZON
Alda S. deOliveira and Carlos A. Nobre Feb. 1985 5 p refs To be presented at the 16th Conf. on Hurricanes and Trop. Meteorol., Houston, Tex., May 1985
(INPE-3407-PRE/676) Avail: NTIS HC A02/MF A01

The penetration of mid-latitude frontal systems into the tropics and its relation to the enhancement of convective activity over the Amazon was investigated. A five year climatology of frontal activity in South America based on GOES satellite imagery was developed. It showed a large number of episodes in which NW-SE oriented convection cloud bands over the continent seemed to be associated with the frontal systems to the east for the crustal spring, summer, and autumn. During winter, frontal systems

rarely organize convection over the Amazon. The preferred position of the frontal systems and associated convective cloud bands to the west-northwest aid in explaining the observed relative annual precipitation maximum extending from western Amazon to southeastern Brazil and into the South Atlantic. A synoptic case study of a frontal passage indicated that the strengthening and progression to the east-northeast of the upper level trough associated with the frontal system may be related to the enhancement of convective activity over central Brazil and the Amazon.
R.S.F.

N85-19573# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INTERANNUAL VARIATIONS OF THE WINTER CIRCULATION IN THE NORTHERN HEMISPHERE AND IN THE SOUTHERN OSCILLATION (MERIDIAN) AND THEIR POSSIBLE CONNECTIONS WITH THE CLIMATE OF NORTHEAST BRAZIL M.S. Thesis [VARIACOES INTERANUAIS DA CIRCULACAO GERAL DE INVERNO NO HEMISFERIO NORTE E DA OSCILACAO SUL (MERIDIONAL) E SUAS POSSIVEIS CONEXOES COM O CLIMA DO NORDESTE BRASILEIRO]
Jose Ivaldo Barbosa deBrito Nov. 1984 92 p refs In PORTUGUESE; ENGLISH summary
(INPE-3333-TDL/182) Avail: NTIS HC A05/MF A01

Interannual variations of the winter circulation in the Northern Hemisphere (NH) and their possible connections with the interannual variation of the precipitation in Northeast (NE) Brazil are studied. The data set used for the NH circulation are the winter grid point geopotential height of the 700mb for the period 1964 to 82. These grid point data are subjected to harmonic analysis yielding amplitudes and phases of zonal harmonics. Using the amplitudes and phases of different harmonics, dynamical quantities such as kinetic energy and momentum transport are calculated. Examination of these quantities did not show any systematic interannual variation, although some interesting connections between them are detected. The connection between NH circulation and NE Brazil rainfall is examined calculating correlation coefficients between rainfall and grid point data of geopotential height field. Significant correlations are found in the region of Siberia, Arctic and Southern Europe. The rainfall distribution in NE Brazil during the 1983 drought year is analyzed. It is found that this is the worst drought that occurred during the last twenty years.
Author

N85-19574# Swiss Inst. of Meteorology, Zurich.
CUT-OFF LOWS AND THEIR INFLUENCE ON THE WEATHER IN SWITZERLAND [ABGESCHLOSSENE HOEHENTIEFS UND IHRE WETTERAUSWIRKUNGEN IN DER SCHWEIZ]
H. W. Courvoisier 1984 44 p refs In GERMAN; ENGLISH, FRENCH, ITALIAN summary
(Rept-45; ISSN-0080-7346) Avail: NTIS HC A03/MF A01

Research on cut-off lows motivated by the difficulties of forecasting their behavior is reported. Cut-off low tracks are even for the best numerical models difficult to forecast and their impact on the weather is problematic. Approximately 269 cut-off lows that occurred between 1965 and 1982 were analyzed. Indications on cut-off low behavior and effects on regional weather are given.
Author

N85-19575# Air Weather Service, Scott AFB, Ill.
EQUATIONS AND ALGORITHMS FOR METEOROLOGICAL APPLICATIONS IN AIR WEATHER SERVICE
G. F. Duffield and G. D. Nastrom 11 Jul. 1984 69 p
(AF Proj. 3370)
(AD-A148894; AD-E850737; AWS/TR-83/001) Avail: NTIS HC A04/MF A01 CSCL 04/2

This document lists equations of algorithms used for computing common meteorological and geophysical variables. It should serve as a handy reference for Base Weather Station computer programmers and thus promote standardization and minimize time consuming literature researches by them. The equations and algorithms are classified into three groups: kinematic properties, thermodynamic properties, and gridded or contoured data fields.
GRA

N85-19576# Naval Environmental Prediction Research Facility, Monterey, Calif.
PROCESSING OF GLOBAL AREA COVERAGE (GAC) DATA OF THE TIROS-N/NOAA SERIES POLAR ORBITERS
V. Treis Oct. 1984 31 p
(AD-A148992; AD-E301513; NEPRF-TR-84-01) Avail: NTIS HC A03/MF A01 CSCL 04/2

Global Area Coverage (GAC) data are stored data of the AVHRR instrument. The original HRPT resolution of 1.1 km is reduced to about 3.3 by 4.0 km. There are 120 scans per minute with 409 pixels each. The raw data are available from the national climatic data center as tape copies that generally contain calibration information. In order to process the data on the SPADS, the data must be unpacked and written to a disk file in a specified format. Then, the image can be transformed in either Mercator or Polar Stereographic projection, and the geographical background may be added.
GRA

N85-19577# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
FROZEN PRECIPITATION AND CONCURRENT WEATHER: A CASE STUDY FOR MUNCHEN-RIEM, WEST GERMANY
M. A. Bilello Nov. 1984 53 p
(DA Proj. 4A7-62730-AT-42)
(AD-A149227; CRREL-SR-84-32) Avail: NTIS HC A04/MF A01 CSCL 04/2

This study evaluates data for two or more meteorological parameters, recorded concurrently, to improve prediction of atmospheric conditions that would obscure a winter battlefield. The analysis considers only freezing precipitation types that were categorized and correlated with simultaneously observed weather conditions, such as temperature, humidity and visibility, using 11 years of winter weather records for Munchen/Riem, Federal Republic of Germany. These results are an example of the unusual and essential environmental information that can be derived from available records. It is suggested that similar investigations should be conducted for other sites in central Europe.
GRA

N85-19578# Range Commanders Council, White Sands Missile Range, N. Mex. Meteorology Group.
METEOROLOGICAL SOUNDING SYSTEM (MSS) STANDARD OPERATING PROCEDURES
Nov. 1984 154 p
(AD-A149513; RCC/MG-355-84) Avail: NTIS HC A08/MF A01 CSCL 04/2

The Meterological Sounding System (MSS) was installed. The following topics related to MSS are discussed: Installation of MSS; General Description of MSS; Preparing for the Rawinsonde Observation; Conducting Upper Air Observations with MSS; Upper Air Observation Postflight Data Reduction; MSS Computer Operations; RCC MG MSS Software and Inventory of Application Programs.
E.A.K.

N85-19579# National Weather Service, Salt Lake City, Utah.
OBLOG: DESIGNED TO CREATE AND MAINTAIN A 49 HOUR OBSERVATION LOG FILE
N. Larsen Dec. 1983 17 p refs
(PB85-109528; NOAA-NWS-WRCP-43) Avail: NTIS HC A02/MF A01 CSCL 04B

A computer program, OBLOG, was designed to create and maintain a 49 hour observation log file for each user specified station. Observation information is drawn and decoded from the decoded observation file SAODATA, which must first be created by the SAODECODER program. The following information is picked out of SAODATA and logged: cloud cover/sky condition; visibility; weather/obstruction to vision; pressure; temperature; dewpoint; relative humidity (computed by the program); wind speed and direction; and gusts. Each log file is set up with the most recent observation first and the oldest last. This provides a visual table

of the last 49 hours that is easily readable and organized.
Author (GRA)

N85-19580# Eastern Pacific Hurricane Center, San Francisco, Calif.
ANNUAL DATA AND VERIFICATION TABULATION FOR EASTERN NORTH PACIFIC TROPICAL STORMS AND HURRICANES, 1983
E. B. Gunther and R. L. Cross Salt Lake City National Weather Service Mar. 1984 36 p refs
(PB85-109635; NOAA-TM-NWS-WR-186) Avail: NTIS HC A03/MF A01 CSCL 04B

The eastern north Pacific tropical cyclone data are summarized and verification statistics are given. Best track, operational positions, and position errors are listed. M.G.

N85-19581# National Hurricane Center, Coral Gables, Fla.
HURRICANE EXPERIENCE LEVELS OF COASTAL COUNTY POPULATIONS: TEXAS TO MAINE
P. J. Herbert, G. Taylor, and R. A. Case Jun. 1984 134 p refs
(PB85-111383; NOAA-TM-NWS-NHC-24) Avail: NTIS HC A07/MF A01 CSCL 04B

Population graphs for the period 1900 to 1980 were prepared for coastal countries from Texas to Maine which could be affected significantly by hurricane winds and/or tides. The Saffir/Simpson Hurrican Scale (range 1 to 5) were used to develop a hurricane climatology for each county for the period 1900 to 1982. The combined statistics graphically illustrate that nearly 80 percent of all Atlantic and Gulf coastal residents of the United States have never experienced the effects of a direct hit by a major hurricane. Author (GRA)

N85-19582# Atmospherics, Inc., Fresno, Calif. Sierra Cooperative Pilot Project.
PRECIPITATION GAGE NETWORK OPERATIONS FOR WINTERTIME RESEARCH IN THE CENTRAL SIERRA NEVADA Technical Report, 1979 - 1984
Michael A. Henderson, Steve Pinion, Ed Pinion, Mark Solak, and Thomas J. Henderson Jul. 1984 41 p refs
(Contract DI-9-07-85-V0020)
(PB85-115020; AISCP-843) Avail: NTIS HC A03/MF A01 CSCL 04B

This document describes the development, installation and maintenance of a precipitation gage network in the Central Sierra Nevada of California. Emphasis is given to calibration techniques performed on Belfort weighing raingages. It contains detailed steps related to key aspects of gage maintenance, calibration, installation and operation important to meeting SCPP requirements. GRA

N85-19583# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
SATELLITE SUPPORT TO THE SIERRA COOPERATIVE PILOT PROJECT: 1979/80 AND 1980/81 Interim Progress Report
Jan L. Behunek and Thomas H. VonderHaar Sep. 1984 84 p refs
(Contract DI-9-07-85-V0025)
(PB85-115079) Avail: NTIS HC A05/MF A01 CSCL 04B

Digital satellite data were collected and analyzed in support of the 1979/80 and 1980/81 Sierra Cooperative Pilot Project (SCPP) field seasons. Data from the visible and IR spectral channels encompassed the Sierra Nevada Range and surrounding regions. All satellite data were carefully navigated to allow the accurate location of geographic points within the images. Those data were permanently archieved on magnetic tape. Remote surface meteorological station data also were collected at Colorado State University. Analyses of the digital satellite data were performed in statistical and case study modes. Cloud top temperature statistics that were computed according to Precipitation Echo Type (PET) diagnosed a mean cloud top temperature for each PET and examined the natural variability of the PETs.
Author (GRA)

N85-19584# Atmospherics, Inc., Fresno, Calif. Sierra Cooperative Pilot Project.
GROUND-BASED SNOW AND ICE CRYSTAL OBSERVATION SYSTEM USED IN SIERRA NEVADA WINTER OROGRAPHIC STORMS Technical Report, 1979 - 1983
Thomas J. Henderson, Mark Solak, Michael A. Henderson, Steve Pinion, and Ed Pinion Apr. 1984 39 p refs
(Contract DI-9-07-85-V0020)
(PB85-115343; AISCP-841) Avail: NTIS HC A03/MF A01 CSCL 04B

This report describes the use of a ground based photographic snow and ice crystal observation system during two winter seasons at a fixed sampling site near the summit of the central Sierra Nevada range of California. This research effort was performed as part of the Bureau of Reclamation's Sierra Cooperative Pilot Project (SCPP), an investigation of the technical feasibility and potential economic benefit of cloud seeding in the Sierra Nevada to supplement the region's water supply. Two specific photographic systems and their operational use are detailed. Data reduction and analysis techniques are also described. GRA

N85-19585# National Hurricane Center, Coral Gables, Fla.
TROPICAL CYCLONE DATA TAPE FOR THE EASTERN AND CENTRAL NORTH PACIFIC BASINS, 1949-1983: CONTENTS, LIMITATIONS AND USES
M. S. Davis, G. M. Brown, and P. W. Leftwich, Jr. Miami Sep. 1984 23 p refs
(PB85-110054; NOAA-TM-NWS-NHC-25) Avail: NTIS HC A02/MF A01 CSCL 04B

A collection of data concerning tropical cyciones in the Eastern and Central North Pacific Oceans has been compiled at the National Hurricane Center. This data set consists of dates, tracks, and maximum sustained wind speeds of tropical cyclones occurring from 1949 to 1983. Surface pressures, when available, are also included. Author (GRA)

N85-19586# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
AN EVALUATION OF WIND MEASUREMENTS BY FOUR DOPPLER SODARS
J. C. Kaimal, J. E. Gaynor, P. L. Finkelstein (Environmental Protection Agency, Research Triangle Park, N.C.), M. E. Graves (Northrop Services, Inc., Research Triangle Park, N.C.), and T. J. Lockhart (Meteorology Research, Inc., Altadena, Calif.) Jul. 1984 120 p refs Sponsored in part by Environmental Protection Agency
(PB85-115301; Rept-5) Avail: NTIS HC A06/MF A01 CSCL 04B

Measurements of wind speed, wind direction, and the vertical component of turbulence, from four different commercially available Doppler sodars, were compared with similar measurements from in situ sensors on a 300 m instrumented tower. Results indicate that the four sodars measure wind speed and direction accurately and with reasonably high precision. The sodars tended to overestimate the vertical component of turbulence at night and to underestimate it during the day. Precision in those measurements was considerably poorer than for the averaged speeds and directions. Author (GRA)

N85-19587# Atmospherics, Inc., Fresno, Calif.
COMPUTER-ASSISTED DATA PROCESSING AND ANALYSIS SYSTEM FOR GROUND-BASED METEOROLOGICAL DATA COLLECTION, REPORT ON THE SIERRA COOPERATIVE PILOT PROJECT Technical Report, 1979-1984
R. Allan, S. Barnes, M. Solk and Thomas J. Henderson Jun. 1984 50 p refs
(Contract DI-9-07-85-V0020)
(PB85-115350; AISCP-842) Avail: NTIS HC A03/MF A01 CSCL 04B

The development and use of a computer system to aid in processing and analysis of data collected from ground-based measurement systems in the Sierra Cooperative Pilot Project (SCPP) is described. Discussions of the primary programs used in

data processing and analysis, as well as a dicussion of quality control in data processing, and a complete listing of all programs used in SCPP are included. GRA

N85-19588# National Weather Service, Washington, D.C. Climate Analysis Center.
MONTHLY AND SEASONAL WEATHER OUTLOOK FOR NOVEMBER, 1984, VOLUME 38, NUMBER 27, OCTOBER 30, 1984
30 Oct. 1984 10 p
(PB85-118800) Avail: NTIS HC A02/MF A01 CSCL 04B

Maps which give observed and probability estimates of temperature and precipitation for November 1984 in the United States and Canada are presented. GRA

N85-19589# National Weather Service, Salt Lake City, Utah. Forecast Office.
CLIMATE OF SALT LAKE CITY, UTAH
Wilbur E. Figgins Oct. 1984 99 p refs
(PB85-123875; NOAA-TM-NWS-WR-152) Avail: NTIS HC A05/MF A01 CSCL 04B

Data concerning the climate of Salt Lake City was assembled. This was a difficult undertaking because of the wide variance of climate in the Salt Lake area. The Wasatch Mountain range, immediately east of the city, and the location of the Great Salt Lake, a short distance to the west, cause a great difference in local microclimates. The Salt Lake City weather records began over 100 years ago; however, the statistics are based on the airport weather records which began May 1, 1928. The airport location continues to the present to be the National Weather Service's official weather observing location for the Salt Lake City area. This provides us with over 55 years of continuous weather information that was observed from an existing or comparable exposure location. However, it must be remembered that various extremes stated, no doubt, were exceeded at other sites in the locality. Any summary such as this must be taken in the context of giving a general view of Salt Lake valley. GRA

N85-19590# National Academy of Sciences - National Research Council, Washington, D. C.
POLAR REGIONS AND CLIMATIC CHANGE: APPENDIX
1984 126 p refs Sponsored in part by Andrew Mellon Foundation, Navy, NOAA, and DOE
(PB85-122679) Avail: NTIS HC A07/MF A01 CSCL 04B

Internal and external factors affecting climatic variations are discussed including: heat budget feedback mechanisms; sea ice and climate; ocean floor sedimante; glacier ice records; lakes and bogs on the tundra; periglacial features as climatic indicators; tree rings; human-induced changes and consequences; and natural changes. GRA

N85-19591# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Natural Disasters.
CALIFORNIA COASTAL EROSION AND STORM DAMAGE DURING THE WINTER 1982 - 1983, A RECONNAISSANCE REPORT
R. G. Dean (Florida Univ., Gainesville), G. A. Armstrong (Department of Boating and Waterways, Sacramento, Calif.), and N. Sitar (California Univ., Berkeley) 1984 83 p
(Grant NSF CEE-82-19358)
(PB85-121705; CETS-CND-023) Avail: NTIS HC A05/MF A01 CSCL 04B

The 1982 to 83 winter season in California was marked by an unusual number of severe storms. By some authoritative accounts, the waves generated by these storms were the most severe of the century. The resulting erosion and structural damage along the California coast were estimated to constitute a loss of several hundred million dollars. One particularly damaging storm occurred from February 27 to March 2, 1983. The effects of the storm were observed and perishable data related to the characteristics of the storm and its effects on structures and the natural system were gathered. The damage to coastal structures and beaches from these storms, the basic reasons for this damage and possible approaches to mitigating future damage are described. GRA

N85-19592# National Weather Service, Salt Lake City, Utah.
HURRICANE PLOTTING PROGRAM
P. D. Tolleson Oct. 1984 32 p refs
(PB85-121432; NOAA-NWS-WRCP-48) Avail: NTIS HC A03/MF A01 CSCL 04B

The completely automated hurrican plotting program (HURCN. SV) provides a detailed description of the progression and prognosis of a tropical system using a single AFOS graphic by decoding marine/aviation advisories issued by the Eastern Pacific Hurricane Center in San Francisco. This program was written to assist the Public Service Unit at WSFO Los Angeles in answering the myriad of public telephone calls each summer and fall for tropical storm information. The program also assists the forecaster in monitoring any particular system in the eastern Pacific Ocean. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-19593 Institute of Oceanographic Sciences, Wormley (England).
SURFACE CURRENTS OF THE INDIAN OCEAN (TO 25 DEG S., 100 DEG E.)
A. N. Cutler and J. C. Swallow 1984 82 p refs
(IOS-187) Avail: NTIS HC A05

A compilation of charts which indicate surface currents in the equatorial Indian Ocean is presented. R.S.F.

N85-19594# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
MIZEX (MARGINAL ICE ZONE PROGRAM): A PROGRAM FOR MESOSCALE AIR-ICE-OCEAN INTERACTION EXPERIMENTS IN ARCTIC MARGINAL ICE ZONES. 5. MIZEX 84. SUMMER EXPERIMENT PI (PRINCIPAL INVESTIGATOR) PRELIMINARY REPORTS
O. M. Johannessen and D. A. Horn Oct. 1984 185 p
(AD-A148986; AD-E301513; CRREL-SR-84-29) Avail: NTIS HC A09/MF A01 CSCL 08/10

The marginal ice zone program (MIZEX) which goal it is to understand the mesoscale processes which dictate the advance and retreat of the ice margin is outlined. The field coordinator's overview, and preliminary reports for the MIZEX 84 Summer experiment are reported. The following categories are summarized: oceanography, ice reconnaissance and formation, meteorology, remote sensing, acoustics, and biology. GRA

N85-19595# Wooster Coll., Ohio.
SUMMER STUDY PROGRAM IN GEOPHYSICAL FLUID DYNAMICS, THE WOODS HOLE OCEANOGRAPHIC INSTITUTION, DYNAMIC DIFFERENTIATION
W. V. R. Malkus and F. K. Mellor 1984 293 p
(Contract N00014-82-G-0079; Grant NSF MCS-82-00450)
(AD-A149386; AD-F300533; WHOI-84-44) Avail: NTIS HC A13/MF A01 CSCL 08/7

Numerous topics in geophysical fluid dynamics are discussed. Thermal convection and double-diffusive convection; the cooling and crystallization from above or below of a fluid with a simple phase diagram; replenished magma chambers; and replenishment of magma chambers; cooling and crystallizing from a side wall; physics of eruptive columns; viscous gravity currents; the motion of a hot, high reynolds number gravity current over an erodable bed; the fluid dynamics of (Komatiite) lava flows three billion years ago; realistic double-diffusive convection between porous media; mixing of fluids of different viscosities--salt water fingers in glycerine; salt fingers in a Hele Shaw Cell; zero potential vorticity flow on an equatorial beta-plane; finite amplitude double-diffusive convection caused by coupled molecular diffusion; heating a salt gradient from a sidewall; particulate dispersal in a time-dependent

flow; and linear instability of continuous heton band clouds are among the topics discussed. GRA

N85-19596# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
APPLICATION OF SLF (STANDARD LINEAR FORMAT) TO DIGITAL HYDROGRAPHIC PRODUCTS Final Report
R. E. Blumberg and M. L. Wagner Dec. 1984 8 p
(AD-A149509) Avail: NTIS HC A02/MF A01 CSCL 08/2

With an ever increasing number of new navigation, weapon, and training systems being developed which use digital cartographic information, the Defense Mapping Agency (DMA) can no longer provide system specific, digital products. DMA has adopted an internal digital data exchange format, called Standard Linear Format (SLF), to permit the exchange of digital data between various production elements. The DMA Feature File, a dictionary of cartographic features and attributes to describe those features, has been developed to standardize digital cartographic features. To test these standards, a digital chart of Portsmouth, Virginia has been produced using the DMA Feature File features encoded in SLF. This digital prototype is being evaluated for its ability to serve as a multiproduct data base to satisfy both digital and paper chart requirements. GRA

N85-19597# Hawaii Inst. of Geophysics, Honolulu. Dept. of Oceanography.
INTERNAL GRAVITY WAVES AND SMALL-SCALE TURBULENCE: PROCEEDINGS OF THE 2ND 'AHA HULIKO'A HAWAIIAN WINTER WORKSHOP
P. Muller, ed. and R. Pujalet, ed. 1984 310 p Workshop held in Manoa, 17-20 Jan. 1984
(Contract N00014-84-G-0008)
(AD-A149510) Avail: NTIS HC A14/MF A01 CSCL 08/3

Contents: Oceanic Shear Spectra from a Submarine; Towed Observations of Internal Waves and Patches of Fine-Scale Turbulence; The Transition from Kelvin-Helmholtz Instability to Turbulence; Internal Waves and Mixing in the Ocean: Observations and Speculations; Richardson Number Approach to Internal Wave Instability in the Ocean and Stratosphere; Recent Observations of Near-Inertial Frequency Internal Waves; The Wavenumber Frequency Spectrum of the Internal Wavefield; The Monthly Variability of the Upper-Ocean Internal Wave Energy: A Progress Report on the Correspondence with Wind Stress; Internal Wave Climatology: An Update; Estimates of Cross-Isopycnal Diffusivities from Climatological Hydrographic Data; Parameterizing the Effects of Internal Waves: Simple Ideas and Things We Need to Know; How Much Internal Wave Energy is Redistributed or Lost Through Bottom Reflection; Interaction of Internal Waves of Near-Inertial Frequencies; Transport of Small-Scale Internal Waves Toward Microstructure; Probing the Internal Wave Strong Interaction Regime by Numerical Experimentation; Small-Scale Vortical Motions; Stability of Inviscid Stratified Flows Under Nonlinear Perturbations; Closure for Turbulent Velocity/Pressure-Gradient Correlations in Nonuniform Flows; The Atmospheric Noise Spectrum-Waves or Stratified Turbulence?; New Directions in Internal Wave and Microstructure Research (reprinted from EOS). GRA

N85-19598# National Oceanic and Atmospheric Administration, Miami, Fla. Oceanographic and Meteorological Labs.
DRIFTING BUOY DATA FROM EQUATORIAL PACIFIC OCEAN, 31 AUG. 1980 - 30 APR. 1982
M. C. Pazos and C. A. Paul (Miami Univ., Fla.) Sep. 1984 116 p refs
(PB85-120046; NOAA-TM-ERL-AOML-60) Avail: NTIS HC A06/MF A01 CSCL 08J

Free drifting buoys were deployed in the equatorial Pacific since 1979 to study the variations of sea surface temperatures and currents in the area. The history and behavior of those buoys deployed from August 21, 1980 through April 30, 1982 is given. A total of 17 buoys are included. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-19599# Texas Univ. Health Science Center, San Antonio. Dept. of Radiology.
GENETIC EFFECTS OF MICROWAVE EXPOSURE ON MAMMALIAN CELLS IN VITRO. VOLUME 2, APPENDIX A: CYTOGENETICS AND GROWTH KINETICS DATA, 850 MHz Annual Report, 1 Jul. 1981 - 30 Sep. 1982
M. L. Meltz, C. R. Harris, and K. A. Walker Oct. 1984 44 p 2 Vol.
(Contract F33615-80-C-0607)
(AD-A148866; USAFSAM-TR-84-24-APP-A) Avail: NTIS HC A03/MF A01 CSCL 06/18

This work is a continuation of studies designed to answer the question of whether radio frequency radiation (RFR) at lower power levels (no greater than 10 mW/sq cm), where measurable heating in the exposure system cannot be detected, causes any transient or permanent alteration in series of subtle biochemical processes elicited in the DNA of mammalian cells. The specific process(es) being studied are: the effects of RFR on repair synthesis in normal human fibroblasts after ultraviolet light damage of the DNA; and the possible induction by RFR of sister chromatid exchanges or chromosome aberrations in Chinese Hamster Ovary cells. Additional information obtained in the latter studies includes any effects on cell viability (by cloning efficiency) or on cell growth (increase in cell number). GRA

N85-19600# Texas Univ. Health Science Center, San Antonio. Dept. of Radiology.
GENETIC EFFECTS OF MICROWAVE EXPOSURE ON MAMMALIAN CELLS IN VITRO. VOLUME 2, APPENDIX B: CYTOGENETICS AND GROWTH KINETICS DATA, 1.2 GHz Annual Report, 1 Jul. 1981 - 30 Sep. 1982
M. L. Meltz, C. R. Harris, and K. A. Walker Oct. 1984 70 p 2 Vol.
(Contract F33615-80-C-0607)
(AD-A148867; USAFSAM-TR-84-24-APP-B) Avail: NTIS HC A04/MF A01 CSCL 06/18

Tabular data from cell survival experiments are included. Chromosome response to radiation effects are listed. B.G.

N85-19601# Tulane Univ., Covington, La. Delta Regional Primate Research Center.
BIOMECHANICAL STUDIES OF IMPACT ACCELERATION RESEARCH Final Technical Report
Peter J. Gerone 15 Dec. 1984 8 p
(Contract N00014-77-C-0305; NR Proj. 207-086)
(AD-A149077) Avail: NTIS HC A02/MF A01 CSCL 06/19

Nonhuman primates were maintained for studies on the biomechanics of acceleration impact research by Navy personnel at Navy facilities. At one time or another during the course of this contract a total of 32 nonhuman primates were housed for the Navy. This included 13 chimpanzees (Pan troglodytes) and 19 rhesus monkeys (Macaca mulatta). Twelve of the 13 chimpanzees were still available at the close of this contract. One of the chimpanzees died on January 24, 1983. The rhesus monkeys remained on the contract until they were transferred to Navy facilities on March 1, 1984. GRA

N85-19602# Columbia Univ., New York. Dept. of Psychology.
BIOELECTROCHEMISTRY 2: MEMBRANE PHENOMENA
D. Schacter 11 Dec. 1984 8 p
(Contract N00014-84-G-0183)
(AD-A149132) Avail: NTIS HC A02/MF A01 CSCL 06/1

The second advanced course on bioelectrochemistry at the International School of Biophysics took place at the Majorana Center in Erice, Italy, during 5-15 November 1984. Three years ago, the first such meeting, also organized by G. MILAZZO (Rome) and M. Blank (New York), had been devoted to redox processes, a subject with strong and obvious links to electrochemistry. The subject of this meeting, membrane phenomena, was much broader,

but the emphasis was on the electrochemical aspects of ion transport, energy transduction, and signal conduction. In addition, there were discussions on three pratical applications of bioelectrochemistry, the effects of applied electric fields on membranes, mediated and non-mediated transport of pharmacologic agents and the exploitation of information about biological membranes in the development industrial processes. GRA

N85-19603# Texas Univ. Health Science Center, San Antonio. Dept. of Radiology.
GENETIC EFFECTS OF MICROWAVE EXPOSURE ON MAMMALIAN CELLS IN VITRO, VOLUME 2 Annual Report, 1 Jul. 1981 - 30 Sep. 1982
M. L. Meltz, C. R. Harris, and K. A. Walker Oct. 1984 91 p 2 Vol.
(Contract F33615-80-C-0607)
(AD-A149347; USAFSAM-TR-84-24-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 06/18

This work is a continuation of studies designed to answer the question of whether radiofrequency radiation (RFR) at lower power levels (no greater than 10 mW/sq cm), where measurable heating in the exposure system cannot be detected, causes any transient or permanent alteration in a series of subtle biochemical processes elicited in the DNA of mammalian cells. The specific process(es) being studied are: the effects of RFR on repair synthesis in normal human fibroblasts after ultraviolet light damage of the DNA; and the possible induction by RFR of sister chromatid exchanges or chromosome aberrations in Chinese Hamster Ovary cells. Additional information obtained in the latter studies includes any effects on cell viability (by cloning efficiency) or on cell growth (increase in cell number). GRA

N85-19604# Oak Ridge National Lab., Tenn.
ARTIFICIAL PHOTOSYNTHESIS WITH ALGAL AND RECONSTITUTED SYSTEMS
E. Greenbaum, M. E. Reeves (Tennessee Univ., Knoxville), and J. Woodward 1984 22 p refs Presented at US-Japan Inform. Exchange Seminar on Photochem. Energy Solar Conversion, Okazaki, Japan, 12 Mar. 1984
(Contract DE-AC05-84OR-21400)
(DE85-002557; CONF-840389-7) Avail: NTIS HC A02/MF A01

A general review of artificial of hydrogenic photosynthesis for the direct production of molecular oxygen and hydrogen is presented. A summary of the Oak Ridge National Laboratory's experimental research program on photosynthetic water splitting using algae is included. The rates of hydrogen and oxygen production in continuous-wave light must be improved significantly before practical developments can proceed. DOE

N85-19605# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES Abstracts Only
13 Feb. 1985 79 p refs Transl. into ENGLISH of various Russian articles
(JPRS-UBB-85-008) Avail: NTIS HC A05/MF A01

Advances are reported in agrotechnology, biochemistry, biophysics, ecology, pollution control, food technology, genetics, immunology, laser effects, microbiology, molecular biology, pharmacology, toxicology, physiology, virology, radiation biology, human factors, public health, nonionizing radiation effects, and medical therapy. For individual titles, see N85-19606 through N85-19615.

N85-19606# Joint Publications Research Service, Arlington, Va.
WORK PHYSIOLOGY OF OPERATING PERSONNEL AT POWER PLANTS IN ARID REGIONS Abstract Only **c54**
I. M. Mommadov, A. G. Grigoryan, and G. A. Tupikova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 22 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 50-51 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

Various physiological parameters were observed in July and August when the ambient temperature exceeded 40 C on a cohort of 20 40-year old, clinically healthy, males. Evaluation of the functional status of the different physiological systems demonstrates that heat is the key factor affecting physiological well-being. The combination of heat and performance requirements placed considerable stress on the homeostatic mechanisms, as reflected in greater energy expenditures for task accomplishment and earlier onset of fatigue. Physiological reserves are directed at maintenance of body temperature balance at the expense of muscular performance under the climatic conditions prevalent in the region. To ensure optimum job performance, exposure to high temperatures must be limited and insolated, air-conditioned, rest facilities must be provided. Workers must have appropriate nutrition, clothing, and vitamin supplements, physical conditioning, and other medical measures that enhance adaptation to arid climates. A.R.H.

N85-19607# Joint Publications Research Service, Arlington, Va.
HEALTH STANDARDS FOR GENERAL VIBRATION Abstract Only **c52**
G. A. Suvorov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 23 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 9-13 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

Theoretical considerations are presented for the assessment and health standardization of the various vibrations that may affect human health. Primary effort is directed at work-related vibrations and the potential of vibration sickness arising from various man-machine interactions. Regulations established by various governmental agencies on allowable vibration levels in different situations in relation to thresholds of perception are discussed. The different intensities and their physiological and health consequences for workers are discussed. In the USSR, effective limit values were established and are being enforced, but are subject to re-evaluation as new scientific data accumulate. A.R.H.

N85-19608# Joint Publications Research Service, Arlington, Va.
EFFECTS OF OVERALL VIBRATION AND NOISE ON OPERATIONAL PERSONNEL Abstract Only **c54**
Yu. N. Kamenskiy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 24 Transl. into ENGLISH fromm Gigiyena Tr. i Prof. Zabolevaniye (Moscow), no. 10, Oct. 1984 p 38-39 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

In order to substantiate recommendations for maximum permissible human exposure to vibration and noise, 10 clinically healthy males, 25 to 44 years of ages, underwent physiological studies to determine the effect of vibration (10 Hz, with 1 m/sq sec acceleration) or noise (90 dB), or a combination of both factors. Evaluation of the heart rate, muscular exertion tests, visual stimuli fusion test, coordination, visual tracking, etc., demonstrated that vibration has a more deleterious effect on the neuropsychological status of humans than does noise within the parameters tested. In addition, in the vibration-noise combination, vibration may mask the noise intensity to 100 dB to 110 dB results in a summation of the adverse effects due to noise and vibration. Author

N85-19609# Joint Publications Research Service, Arlington, Va.
MANAGEMENT OF VIBRATION SICKNESS IN COAL MINES BY HYPERBARIC OXYGENATION Abstract Only **c52**
N. P. Soboleva *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 30 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 41-42 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

Clinical trials were conducted with hyperbaric oxygenation in the management of vibration sickness in 30 coal miners, 42 to 47 years of age. Assessment of the results of symptomatology and objective laboratory criteria (tetrapolar finger rheography, occulsion plethysmography) demonstrate market improvements in the treated subjects. Headaches disappeared or diminished in intensity, irritability, and fatigability became less pronounced, sleep

improved, and the emotional status of the workers provided additional confirmation of the salubrious effects. Among the more pronounced objective findings were the increase in the filling volume and in the blood flow of the peripheral vasculature, and a three-fold decrease in peripheral vascular resistance (from 97 + or 18.2 mm/ml/100 g/min in untreated controls, to 29.0 + or - 6.4 mm/ml/100 g/min in the treated subjects). Author

N85-19610# Joint Publications Research Service, Arlington, Va.
COMPARATIVE ASSESSMENT OF DIFFERENT TREATMENT MODALITIES IN MINERS WITH VIBRATION- AND NOISE-INDUCED DISEASE Abstract Only **c52**
M. L. Velskaya, M. A. Nekhorosheva, S. I. Konovalova, G. V. Kukhtina, I. G. Gonchar, D. P. Terentyeva, L. A. Grishchenko, N. P. Soboleva, S. A. Kharitonov, and I. V. Priklonskiy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 31 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 16-19 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

A group of 71 miners with vibration sickness and noise-induced pathology were managed either by standard methods, or in combination with acupuncture and/or hyperbaric oxygenation for a comparative assessment of the effectiveness of the different therapeutic approaches. Analysis of subjective factors as well as standard physiological parameters (EKG, rheoencephalography, peripheral rheography, EEG, neuropsychological tests) demonstrate that both acupuncture and hyperbaric oxygenation are effective modalities in the majority of the subjects. Nevertheless, the lack of improvement in certain criteria, or even what could be regarded as adverse sequelae, suggest that the use of hyperbaric oxygenation in the management of such disorders be approached with considerable care. Author

N85-19611# Joint Publications Research Service, Arlington, Va.
MANAGEMENT OF MICROCIRCULATORY DISORDERS IN VIBRATION SICKNESS Abstract Only **c52**
M. I. Loseva, T. M. Sukharevskaya, A. M. Pakhomonova, V. A. Sutormin, and V. Ye. Dikker *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 31-32 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 19-22 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

Addition of heparin or venoruton to standard management of vibration sickness was tested on 116 patients on the basis of autocoagulation test, platelet aggregration, capillary permeability, arteriovenous oxygen balance, and oxygen utilization. While standard therapeutic measures commonly employed in the treatment of vibration-induced microcirculatory disturbances yielded improvements of 2 to 4 months duration, incorporation of heparin into the therapeutic regimen (20,000 U/day parenterally, subsequently reduced to 5000 U and hand massage with heparin paste, or 10,000 U/day and subsequent massage, both approaches applied for an average of 3 weeks) or venoruton (5 ml i.m. for 5 days, followed by 1 capsule (300 mg) b.i.d. for one week and subsequent hand bassage with venoruton paste) resulted in improvements that persisted for 6 months. Author

N85-19612# Joint Publications Research Service, Arlington, Va.
MODULATED SINUSOIDAL CURRENTS IN MANAGEMENT OF VIBRATION SICKNESS Abstract Only **c52**
M. M. Gerasimova and T. S. Kupriyanova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 43 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 39-41 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

Modulated sinusoidal currents (70 Hz, 75% modulated, 12 min/session, 10 to 12 sessions) were tested for therapeutic effectiveness on 79 male and female grinders and polishers with evidence of vibration sickness. The patients were monitored both subjectively and objectively (pallesthesiometry, electrothermometry, rheography, nail bed capillaroscopy) and divided into two groups on the basis of whether they were also treated with vitamins B or not. Prior to treatment all subjected showed depressed skin temperature, increased vascular tonus, and increased threshold of pallesthesia at 65 and 125 Hz frequencies. Following treatment with the modulated current both groups showed elevation in skin temperature, a decrease in pallesthesia threshold, and diminished vascular tonus in most of the patients. The results were specially satisfactory in the group on vitamin therapy, and indicate that a combination of vitamin B therapy and modulated sinusoidal current is effective in normalizing peripheral vascular status in patients with vibration sickness. Author

N85-19613# Joint Publications Research Service, Arlington, Va.
EFFECTS OF PARTIAL DEPRIVATION OF SLOW-WAVE SLEEP ON SLEEP-WAKEFULNESS CYCLES Abstract Only **c52**
T. N. Oniani, E. O. Chidzhavadze, and L. M. Maisuradze *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 44 Transl. into ENGLISH from Fiz. Zh. SSSR Imeni I. M. Sechenov (Leningrad), v. 70, no. 8, Aug. 1984 p 1142-1148 Original language document was announced in IAA as A85-13300 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

In an experimental investigation of cat sleep-wakefulness cycles, it is shown that partial (35 to 55 percent) deprivation of slow-wave sleep by electrical stimulation of the brain-stem activating structures can lead to an enhancement of behavioral sleep and a reduction of paradoxical sleep. The reduction of paradoxical sleep was induced by fragments of behavioral EEG wakefulness. In this situation no return to paradoxical sleep was observed in the postdeprivation period. The interrelationships of different phases of the sleep-wakefulness cycle are examined, as well as the interaction of EEGs and the behavioral mechanisms of sleep and wakefulness. I.H.

N85-19614# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE MEASUREMENT OF HUMAN AUDITORY ACUITY Abstract Only **c52**
V. V. Popov and A. Ya. Supin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 44 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 278, no. 4, Oct. 1984 p 1012-1016 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

Preliminary data are presented on an approach toward the evaluation of human auditory acuity, i.e., the minimum perceived interval between spectral peaks in an auditory signal using a modulated quasi-bell signal. Human subjects were tested both under psychophysiological and standard (pressing signal buttons) conditions; comparable results were seen. The method was therefore deemed useful in measuring human auditory acuity. The measured parameter characterizes the dependence of threshold contrast on ridge frequency of the signal, or the critical frequency perceived with 100% depth modulation. For the subjects tested, this was determined to be in the range of 20 to 25 /kHz, which corresponds to an interridge interval of 50 to 40 Hz. Author

N85-19615# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF HYPERTHERMIA ON BODY TEMPERATURE AND CONTENT OF CATECHOLAMINES IN WHITE RAT HYPOTHALAMUS Abstract Only
F. F. Sultanov, Kh. A. Mezidova, and B. N. Manukhin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 46 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 5, Aug. 1984 p 1274-1275 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

The dynamics of the biogeneous monoamines (noradrenaline, dopamine, and serotonin) were studied in the hypothalamus of rats during hyperthermia and for a period of 10 days after hyperthermia. Experiments were performed on male Wistar white rats, placed in a well-ventilated heating chamber for 30 and 60 minutes at a temperature of 45 C. Rectal temperature was

monitored. After 30 minutes of hyperthermia, the hypothalamus undergoes significant changes in terms of its content of noradrenaline, dopamine and serotonin, with a reliable increase in noradrenaline during hyperthermia, followed after 24 hours by a drop to 43% below the level of the control, an increase by 48 hours, then gradual normalization. The dynamics of the content of dopamine are similar to those of noradrenaline. The content of serotonin changes approximately the same way as the catecholamines, although the changes are less severe, never falling below the control. Hyperthermia thus causes long-term changes in the metabolism of biogenous amines in the hypothalamus. Author

N85-19616# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES Abstracts Only
26 Feb. 1985 93 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-011) Avail: NTIS HC A05/MF A01

This U.S.S.R. report presents research developments in biomedical and behavioral sciences. Subject matter covered includes: (1) aerospace medicine; (2) human factors; (3) electrosleep therapy; and (4) visual recognition processes. For individual titles, see N85-19617 through N85-19624.

N85-19617# Joint Publications Research Service, Arlington, Va.
SPECIFICS OF HUMAN THERMAL REGULATORY REACTIONS UPON EXPOSURE TO CORIOLIS ACCELERATION Abstract Only c52
O. Ya. Plepis and L. A. Glaznikov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 1 Transl. into ENGLISH from Zh. Ushnykh, Nosovykh i Gorlovykh Bolezney (Kiev), no. 5, Sep. - Oct. 1984 p 9-15 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

This work is dedicated to determination of quantitative formulas for control of thermoregulatory vascular reactions in human skin in the area of the forehead upon exposure to coriolis forces. A method of continuous accumulation of coriolis forces was used with the subject seated on a rotating chair. Skin temperature dynamics were recorded as a vestibular autonomic reaction. A high and direct variation was determined between skin temperature reaction and time of tolerance of the subjects. The mathematical calculations of the dynamics of the temperature reaction of the skin upon exposure to stimulative coriolis forces, parabolic after movement stops. Author

N85-19618# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF FUNCTIONAL MOBILITY OF HUMAN NERVOUS SYSTEM WITH THE PNN-3 INSTRUMENT Abstract Only c52
N. V. Makarenko, N. V. Kolchneko, and Yu. L. Maydikov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 18 Transl. into ENGLISH from Zh. Vyssh. Nervnoy Deyatelnosti imeni I. P. Pavlova (Moscow), v. 34, no. 5, Sep. - Oct. 1984 p 972-974 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

The PNN-3 instrument is used for rapid diagnosis of the psychophysiological specifics of truck drivers but can be used for other psychophysiological studies. The device allows production of quantitative indices of the functional mobility of the nervous system within 5 to 7 minutes by determination of the fastest possible correct differentiation of positive and inhibitory stimuli, as well as the latent period of the visual-motor reaction of selection from among three types of stimuli. This article presents a description of the method of using the instrument. A test subject sees a light, which may be red, yellow or green. If the light is green, he is instructed to press the button beneath his left hand; if red, the button beneath the right hand; if yellow - neither button. A group of 74 males 25 to 39 years of age was tested 3 times, with intervals of 2 months and 1 year between tests. Results obtained were strongly correlated, indicating reliability of the test results produced by the instrument. Author

N85-19619# Joint Publications Research Service, Arlington, Va.
VARIABILITY OF CARDIAC RHYTHM DURING INFORMATION LOADING Abstract Only c52
A. I. Stankus and Ye. N. Sokolov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 19 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 10, no. 5, Sep. - Oct. 1984 p 852-858 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

A study is presented of changes of the structure of the cardiac rhythm under the influence of measured information loading, achieved by gradually increasing the complexity of the task of distinguishing audio signals. The task of the subject was to recognize signals at a given frequency. In each subsequent stage of the test, the frequency of incorrect signals was closer to the frequency of the correct signal to which the subject was to respond. In the healthy test-subjects, the information load resulted in an increase in heart rate, with a simultaneous decrease in the total energy of the rhythmogram spectrum. Cluster analysis of curves of the variation in R-R interval as a function of stage of the study revealed two major types of curves, allowing the test-subjects to be divided into two major groups. In the first group, with higher initial heart rate, the degree of heart rate which increases during information load was also greater. Subjects with a higher level of parasympathetic influence were more effective in processing the information presented. Author

N85-19620# Joint Publications Research Service, Arlington, Va.
STUDY OF COGNITIVE STYLES OF STUDENTS IN AUTOMATED TEACHING SYSTEM Abstract Only c53
Tatyana Aleksandrovna Brutsentsova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 19-20 Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, Jul. - Aug. 1984 p 70-76 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

Computer-assisted experiments revealed cognitive styles in students which must be considered during development of computer-assisted teaching systems and showed the possibility of using computer-based teaching systems in psychological study of aspects of teaching. Subjects included 12 8th grade students and 7 Moscow State University students using 3 variants of the BASIC language. Two cognitive styles were noted. Subjects with cognitive style A acted impulsively without preliminary analysis of the situation, used trial and error and guess work and did not worry about mistakes, while those with cognitive style B were very cautious, analyzed carefully in order to avoid errors, checked their answers carefully, made few errors but were greatly bothered by them. The experiments showed the advisability of using computer-assisted teaching methods in teaching students with individual differences. A brief account of the history of the study of this problem is presented. Author

N85-19621# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL ROLE OF TYPE OF PERSON'S TEMPERAMENT IN INDIVIDUAL AND MUTUAL ACTIVITY Abstract Only c53
Valeriy Vladimirovich Belous *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 20 Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, Jul. - Aug. 1984 p 102-107 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

Study of 48 students, ranging in age from 18-20 years, in 2 series of experiments, revealed an A-type temperament (extroverted, changeable, not overly cautious, emotional and impulsive) and a B-type temperament (introverted, rigid and anxious). A-type subjects were more successful in work requiring speed in reception and processing of information while B-type subjects excelled at regulated activity, controlled by the subject himself. Subjects with different types of temperament were equally valuable in individual higher level activities. Effectiveness of common activity was linearly dependent on properties of the psychodynamic level of integral individuality. Author

N85-19622# Joint Publications Research Service, Arlington, Va.
DIALOG SYSTEM OF PREPARATION AND PRESENTATION OF VISUAL INFORMATION Abstract Only **c53**
Aleksey Pavlovich Kulaichev, Dina Mikhaylovna Ramendik, and Mariya Valeryevna Slavutskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 20 Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, Jul. - Aug. 1984 p 118-120 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

A dialog system to be used as an automated means of preparing and carrying out experimental studies of men solving problems involving visual presentation of information is described. Detailed explanation of the operation of the system is presented and an experiment of an engineering psychological nature and one involving study of solution of complex logic problems are presented and discussed. The experimenter may employ the display and its standard keyboard to set up and carry out the experiment. B.W.

N85-19623# Joint Publications Research Service, Arlington, Va.
ELECTROSLEEP THERAPY ADVANCED AT MEDICAL INSTITUTE Abstract Only **c52**
In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 29 Transl. into ENGLISH from Med. Gazeta (Moscow), 7 Dec. 1984 p 3 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

Methods for preventing nervous disorders and overstress and on the improvement of electrostimulation methods for the treatment of various disorders are investigated. Conventionally practiced electrosleep methods do not take into account functional features and interactions of the brain's hemispheres. As a result, a selective method of cerebral electrostimulation using a pulsed current, optimal parameters of which are selected for the right and left hemispheres separately, taking the patient's individual signs into account was developed. This method makes is possible to heighten the therapeutic effect of electrosleep substantially and to shorten and streamline the course of therapy, it is claimed. B.W.

N85-19624# Joint Publications Research Service, Arlington, Va.
RESTRUCTURING OF THE PROCESS OF VISUAL RECOGNITION AS PERCEPTION CONDITIONS ALTER Abstract Only **c53**
V. M. Krol and Ye. I. Bondar *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 70 Transl. into ENGLISH from Zh. Vyssh. Nervnoy Deyatelnosti imeni I. P. Pavlova (Moscow), v. 34, no. 5, Sep. - Oct. 1984 p 975-977 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

Two series of experiments were performed. The purpose of the first was to compare the course of the process of recognition of test signals in situations in which test subjects were previously familiarized with the test and knew what signals would be presented, or when they were not familiar with the alphabet of images used. In the second series of experiments a procedure of doubling the exposure of test figures was used. During the first portion of each experiment the time of presentation of the tests was gradually increased. After the threshold of the stage of identification was reached, the time of presentation was increased again, though in neither case were the test subjects informed what image would be presented. The results of both series showed that perception of test figures under conditions such that subjects know their form and position as in the first series or following preliminary activation of their perceptive description as in the second series involves statistically reliable reduction of the threshold of most stages of the recognition process. This indicates a change in the time characteristics of the individual stages of perception. B.W.

N85-19625# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
19 Feb. 1985 64 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-009) Avail: NTIS HC A04/MF A01

The following topics relating to biomedical and behavioral sciences are considered: aerospace medicine, biotechnology, medicine, pharamacology and toxicology, physiology, public health, and veterinary medicine. For individual titles, see N85-19626 through N85-19627.

N85-19626# Joint Publications Research Service, Arlington, Va.
BE HEALTHY, PILOT **c52**
A. Potapenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-009) 19 Feb. 1985 p 1-2 Transl. into ENGLISH from Leningr. Pravda (Leningrad), 24 Nov. 1984 p 4 (For primary document see N85-19625 10-51)
Avail: NTIS HC A04/MF A01

A complex Soviet program of ergonomic studies called pilot is described. The program is involved with all aspects of the professional activity of flight control staff. Preflight biomedical monitoring of pilots is mentioned. R.S.F.

N85-19627# Joint Publications Research Service, Arlington, Va.
METHODS OF MONITORING MENTAL WORK EFFICIENCY, EMOTIONAL ACTIVITY **c53**
K. R. Stavitskiy and N. A. Gosudarev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-009) 19 Feb. 1985 p 22-26 refs Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 11, Nov. 1984 p 48-49 (For primary document see N85-19625 10-51)
Avail: NTIS HC A04/MF A01

A method is presented for monitoring the mental work efficiency of a person by measuring the electroencephalogram constant component. Another method for determining the level of emotional activity by galvanic skin response techniques is also discussed. The central nervous system is monitored as an index of fatigue. R.S.F.

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-19628* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Mar. 1985 65 p
(NASA-SP-7011(269); NAS 1.21:7011(269)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 180 reports, articles and other documents introduced into the NASA scientific and technical information system in February 1985. Author

N85-19629*# National Aeronautics and Space Administration, Washington, D. C.
AIRCRAFT NOISE EFFECTS: AN INTERDISCIPLINARY STUDY OF THE EFFECTS OF AIRCRAFT NOISE ON MAN. PART 1: BASIC REPORT
Jun. 1980 408 p refs Transl. into ENGLISH from the book "Fluglaermwirkungen. Eine Interdiziplinaere Untersuchungen ueber die Auswirkungeri des Fluglaerms auf den Menschen. Hauptbericht" Bonn-Bad Godesberg, West Germany, Harald Boldt Verlag KG, 1974 p 425-500; 540-558 Transl. by Kanner (Leo) Associates, Redwood City, Calif. 3 Vol.
(Contract NASw-3199)
(NASA-TM-75819; NAS 1.15:75819) Avail: NTIS HC A18/MF A01 CSCL 06S

An area around the Munich-Riem airport was divided into 32 clusters of different noise exposure and subjects were drawn from each cluster for a social survey and for psychological, medical, and physiological testing. Extensive acoustical measurements were

also carried out in each cluster. The results were then subjected to detailed statistical analysis. R.S.F.

N85-19630*# National Aeronautics and Space Administration, Washington, D. C.
AIRCRAFT NOISE EFFECTS: AN INTERDISCIPLINARY STUDY OF THE EFFECT OF AIRCRAFT NOISE ON MAN. PART 2: APPENDIX
Dec. 1980 124 p Transl. into ENGLISH from the book "Fluglaermwirkung. Eine Interdiziplinaere Untersuchung ueber die Auswirkungen des Fluglaerms auf den Menschen. Annexband" Bonn-Bad Godesberg, West Germany, Harald Boldt Verlag KG, 1974 p 1-83; 143; 149-150; 201-228 Transl. by Kanner (Leo) Associates, Redwood City, Calif. 3 Vol.
(Contract NASw-3199)
(NASA-TM-75818; NAS 1.15:75818) Avail: NTIS HC A06/MF A01 CSCL 06S

A survey used to obtain data of a sociological nature regarding subjects used in a study of aircraft noise perception and tolerance near the Munich-Reims airport is presented. Statistics compiled on occupational, physiological, and medical aspects of the subjects are tabulated. A.R.H.

N85-19631*# National Aeronautics and Space Administration, Washington, D. C.
AIRCRAFT NOISE EFFECTS: AN INTER-DISCIPLINARY STUDY OF THE EFFECT OF AIRCRAFT NOISE ON MAN. PART 3: SUPPLEMENTARY ANALYSES OF THE SOCIAL-SCIENTIFIC PORTION OF THE STUDY ON AIRCRAFT NOISE CONDUCTED BY THE DFG
Rudoph Schumer Dec. 1980 82 p refs Transl. into ENGLISH of the book "Fluglaermwirkungen. Eine Interdiziplinaere Untersuchung ueber die Auswirkungen des Fluglaerms auf den Menschen. Ergaenzende Analysen zum Sozialwissenschaftlichen Untersuchungsteil des Fluglaermoprojeketes der DFG" Bonn-Bad Godesberg, West Germany, Harald Boldt Verlag KG, 1974 p 1-68 Transl. by Kanner (Leo) Associates, Redwood City, Calif. 3 Vol.
(Contract NASw-3199)
(NASA-TM-75802; NAS 1.15:75802) Avail: NTIS HC A05/MF A01 CSCL 06S

Variables in a study of noise perception near the Munich-Reims airport are explained. The interactive effect of the stimulus (aircraft noise) and moderator (noise sensitivity) on the aircraft noise reaction (disturbance or annoyance) is considered. Methods employed to demonstrate that the moderator has a differencing effect on various stimulus levels are described. Results of the social-scientific portion of the aircraft noise project are compared with those of other survey studies on the problem of aircraft noise. Procedures for contrast group analysis and multiple classification analysis are examined with focus on some difficulties in their application. A.R.H.

N85-19632# Army Research Inst. of Environmental Medicine, Natick, Mass.
SKELETAL MUSCLE METABOLISM DURING EXERCISE IS INFLUENCED BY HEAT ACCLIMATION
A. J. Young, M. N. Sawka, L. Levine, B. S. Cadarette, and K. B. Pandolf 13 Dec. 1984 32 p
(DA Proj. 3E1-62777-A-879)
(AD-A148845; AD-F300518; USARIEM-M-10/85) Avail: NTIS HC A03/MF A01 CSCL 06/19

The influence of heat acclimation on skeletal muscle metabolism during sub-maximal exercise was studied in 13 healthy men. The subjects performed 30 min of cycle exercise (70% of individual maximal oxygen uptake) in a cool (21 deg C, 30% rh) and a hot (49 deg C, 20% rh) environment both before and again after they were heat acclimated. Aerobic metabolism was lower (P 0.01) in the heat as compared to the cool both before and after heat acclimation. Anaerobic metabolism (indicated by changes in muscle and blood lactate) was increased (P 0.01) in the hot relative to the cool environment, both before and after acclimation. Acclimation lowered (P 0.01) aerobic and anaerobic metabolism in both environments. Despite higher respiratory exchange ratios (R) in the heat, the amount of muscle glycogen utilized during exercise did not differ from that in the cool, either before or after acclimation. However, muscle glycogen utilization and R were reduced in both environments following acclimation. These findings show that: (1) anaerobic muscle metabolism increased to compensate for a decreased aerobic metabolism during exercise in the heat; (2) muscle glycogen is not the carbohydrate substrate for the increased muscle lactate production during exercise under extreme heat stress; and (3) heat acclimation lowers both the aerobic and anaerobic rate of metabolism during exercise in a cool as well as a hot environment. GRA

N85-19633# Army Research Inst. of Environmental Medicine, Natick, Mass.
ASSESSMENT OF MUSCLE STRENGTH AND PREDICTION OF LIFTING CAPACITY IN US ARMY PERSONNEL
J. E. Wright, D. S. Sharp, J. A. Vogel, and J. F. Patton 5 Dec. 1984 46 p
(AD-A148846; AD-F300518; USARIEM-M-9/85) Avail: NTIS HC A03/MF A01 CSCL 06/19

The purpose of this study was to determine muscular strength tests which would be appropriate for Army occupational selection and predictive of job lifting and lifting-carrying tasks. A maximum lift to 132 cm, dead lift to knuckle height and a short term self-paced maximal lift-and-carry were utilized as criterion tasks. Isometric strength measures evaluated as predictors included: handgrip, knee extension, trunk extension, upper torso arm-shoulder pull down, standing upward pull at 38 cm and 132 cm height. Dynamic strength of the trunk extensors were also measured with an isokinetic dynamometer. Studies employed both male and female soldiers. Initial analysis selected six isometric strength measures plus lean body mass as potential predictors of the best criterion variable, maximum lift capacity to 132 cm (MSLC). Males and females formed separate populations (non-coincidence) in these measures so that gender could be represented by a numerical designator as a constituent variable in a single predictive equation. Handgrip, 38cm upright pull and upper torso pull down gave similar predictive power. Ridge regression techniques were utilized to compensate for multicollinearity effects among these predictors. GRA

N85-19634# Army Research Inst. of Environmental Medicine, Natick, Mass.
HEMODYNAMICS RESPONSES TO UPRIGHT TILT AT SEA LEVEL AND HIGH ALTITUDE
C. S. Fulco and A. Cyerman 12 Dec. 1984 25 p
(DA Proj. 3E1-62777-A-879)
(AD-A148848; AD-F300518; USARIEM-M-11/85) Avail: NTIS HC A02/MF A01 CSCL 06/19

Absolute and compensatory responses to a circulatory challenge were studied by determining the changes occurring in heart rate (HR), stroke volume (SV), cardiac output (CO), calf blood flow (CBF) blood pressure (BP), total peripheral resistance (TPR), plasma norepinephrine (Nor) and blood volume (BV). Eight young men were tested at sea level (SL)); after 1h at 4300m simulated altitude (SA); and at 18h, 66h and 114h during residence at 4300m (HA). HR, SV, CO, CBF, TPR and BP were obtained during supine rest and after 13 min of 60 deg head-up tilt, using an impedance monitor and an electrosphygmomanometer. With continued exposure, SV, CO, TPR, and CBF responses were reduced ($p<or=.05$). These reductions were associated with a 10% decline in BV ($p<or=.01$) and a 40% increase in Nor ($p<or=.05$). It is concluded that the reduction in SV during tilt at SL and SA is compensated for by an increase in HR and TPR in order to maintain BP. After 18h HA, BP is maintained by an increase in HR and a greater and more prolonged venoconstriction. GRA

N85-19635# New Mexico Univ., Albuquerque. School of Medicine.
THE EFFECT OF INERT GASES ON ION TRANSPORT ACROSS THE ERYTHROCYTE MEMBRANE Final Report, 1 Jun. 1976 - 31 May 1984
W. R. Galey 18 Dec. 1984 21 p
(Contract N00014-76-C-0815)

(AD-A148889; AD-E850737) Avail: NTIS HC A02/MF A01 CSCL 06/16

Hyperbaric argon stimulates active transport of sodium and potassium in the human erythrocyte. These increases in active uptake of potassium and active extrusion of sodium from the cell are related to the partial pressure of the ENG. Moderate hydrostatic pressures depress active transport in these same cells. This depression is seen under hyperbaric pressures of argon-helium mixtures to exert an effect proportional to the pressure exerted. Nitrogen, a less potent ENG than argon, increases active transport across cell membranes but to a lesser degree. This shows again the parallel between the behavioral actions of hyperbaric ENGs and their effects on cell membrane ion transport. Although active transport is stimulated by ENGs and inhibited by pressure, the ability of Na-K, ATPase (the transport enzyme) of cell membranes to hydrolize ATP is not affected by these conditions. This suggests that the effects of pressure and ENGs may be on the stochiometry or efficiency of the pump rather than on its activity per se. GRA

N85-19636# Naval Submarine Medical Research Lab., Groton, Conn.

EFFECT OF EXTREME PERIPHERAL LIGHT ON DARK ADAPTATION Interim Report

S. M. Luria and J. DiVita 16 Nov. 1984 16 p

(AD-A148923; NSMRL-1039) Avail: NTIS HC A02/MF A01 CSCL 06/16

The effects of dark adaptation of light leaking around the edges of a spectacle frame worn under ambient light levels of 0.4 and 15 foot-Lamberts for 0.5 to 5 minutes were measured. Younger observers were virtually unaffected by light leaks in ambient illumination of 0.4 fL. However, after 5 minutes in ambient illumination of 15 fL, they required about 45 seconds to recover complete dark adaptation, and observers over the age of 40 required nearly three minutes. GRA

N85-19637# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

MEDICALLY DISQUALIFIED AIRLINE PILOTS

S. J. Dark Aug. 1984 20 p

(AD-A149454; FAA-AM-84-9) Avail: NTIS HC A02/MF A01 CSCL 06/5

Observations on the airline pilot group probably come as close to a true reflection of incidence of disqualifying disease as is possible to observe. Prescreening by airline companies before employment and the FAA's requirements for issuance of a first-class medical certificate result in this group's being essentially purged of a disease prevalence that contributes to higher rates for other groups. These individuals are also less likely to voluntarily remove themselves from followup observations for known medical conditions that could preclude FAA medical certification. This study examined medical records of airline pilots medically disqualified by the FAA over a 220-year period. Date of birth, employer, date of disqualification, and reason for disqualification were recorded for each pilot. The data represent the final action taken on each pilot for a particular examination. During this period, 842 airline pilots were medically disqualified. Cardiovascular diseases represent the highest cause for denial, with age being a major factor in the incidence of cardiovascular disease. Denials for cardiovascular reasons account for 50% of all denials in this group. FAA medical certificate denial is minimal before age 45 but increases rapidly thereafter, with cardiovascular diseases responsible for more than half of this dramatic rise in incidence of disease. Maintenance of high standards of safety requires close cardiovascular supervision as pilots grow older. GRA

N85-19638# Environmental Protection Agency, Cincinnati, Ohio. Environmental Criteria and Assessment Office.

HEALTH ASSESSMENT DOCUMENT FOR CARBON TETRACHLORIDE Final Report

Christopher T. DeRosa, Richard Hertzberg, Shella Rosenthal (EPA, Washington, D.C.), and Cynthia Sonich Sep. 1984 321 p refs (PB85-124196) Avail: NTIS HC A14/MF A01 CSCL 06T

Carbon tetrachloride (CCl4) is a haloalkane with a wide range of industrial and chemical applications. Its presence in the atmosphere and in water appears to be of anthropogenic origin. It is readily absorbed through the lung, gastrointestinal tract and skin and, therefore, poses a hazard to human health. This document is an assessment of the literature available up to March 1983, with the exception of the effect of CCl4 on stratospheric ozone, to reflect the most recent development in this area. The scientific literature was inventoried, key studies were evaluated and summaries and conclusions were prepared to qualitatively identify the chemical's toxicity and related characteristics. Observed effect levels and dose-response relationships are discussed evaluating the potential toxicity of CCl4. GRA

N85-19639# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Criteria and Assessment Office.

MERCURY HEALTH EFFECTS UPDATE: HEALTH ISSUE ASSESSMENT Final Report

Thomas Clarkson (Rochester Univ.), Joan Cranmer (Arkansas Univ., Little Rock), Donna J. Sivulka (EPA, Research Triangle Park, N.C.), and Ralph Smith (Michigan Univ., Ann Arbor) Aug. 1984 152 p refs

(PB85-123925; EPA/600-8-84-019F) Avail: NTIS HC A08/MF A01 CSCL 06T

This report reviews and evaluates the scientific information on the potential health effects from mercury exposure, with emphasis on those effects associated with human chronic inhalation exposures. The findings are based on a review of the scientific literature since the promulgation of the 1973 National Emission Standard for Mercury. This report consists of six chapters that provide a cohesive discussion of all aspects of mercury exposure and focus upon those data thought to be the most useful and relevant for human health risk assessment purposes.

Author (GRA)

N85-19607# Joint Publications Research Service, Arlington, Va.

HEALTH STANDARDS FOR GENERAL VIBRATION Abstract Only

G. A. Suvorov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 23 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 9-13 (For primary document see N85-19605 10-51)

Avail: NTIS HC A05/MF A01

N85-19609# Joint Publications Research Service, Arlington, Va.

MANAGEMENT OF VIBRATION SICKNESS IN COAL MINES BY HYPERBARIC OXYGENATION Abstract Only

N. P. Soboleva *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 30 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 41-42 (For primary document see N85-19605 10-51)

Avail: NTIS HC A05/MF A01

N85-19610# Joint Publications Research Service, Arlington, Va.

COMPARATIVE ASSESSMENT OF DIFFERENT TREATMENT MODALITIES IN MINERS WITH VIBRATION- AND NOISE-INDUCED DISEASE Abstract Only

M. L. Velskaya, M. A. Nekhorosheva, S. I. Konovalova, G. V. Kukhtina, I. G. Gonchar, D. P. Terentyeva, L. A. Grishchenko, N. P. Soboleva, S. A. Kharitonov, and I. V. Priklonskiy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 31 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 16-19 (For primary document see N85-19605 10-51)

Avail: NTIS HC A05/MF A01

N85-19611# Joint Publications Research Service, Arlington, Va.

MANAGEMENT OF MICROCIRCULATORY DISORDERS IN VIBRATION SICKNESS Abstract Only

M. I. Loseva, T. M. Sukharevskaya, A. M. Pakhomonova, V. A. Sutormin, and V. Ye. Dikker *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 31-32

Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 19-22 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

N85-19612# Joint Publications Research Service, Arlington, Va.
MODULATED SINUSOIDAL CURRENTS IN MANAGEMENT OF VIBRATION SICKNESS Abstract Only
M. M. Gerasimova and T. S. Kupriyanova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 43 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 39-41 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

N85-19613# Joint Publications Research Service, Arlington, Va.
EFFECTS OF PARTIAL DEPRIVATION OF SLOW-WAVE SLEEP ON SLEEP-WAKEFULNESS CYCLES Abstract Only
T. N. Oniani, E. O. Chidzhavadze, and L. M. Maisuradze *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 44 Transl. into ENGLISH from Fiz. Zh. SSSR Imeni I. M. Sechenov (Leningrad), v. 70, no. 8, Aug. 1984 p 1142-1148 Original language document was announced in IAA as A85-13300 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

N85-19614# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE MEASUREMENT OF HUMAN AUDITORY ACUITY Abstract Only
V. V. Popov and A. Ya. Supin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 44 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 278, no. 4, Oct. 1984 p 1012-1016 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

N85-19617# Joint Publications Research Service, Arlington, Va.
SPECIFICS OF HUMAN THERMAL REGULATORY REACTIONS UPON EXPOSURE TO CORIOLIS ACCELERATION Abstract Only
O. Ya. Plepis and L. A. Glaznikov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 1 Transl. into ENGLISH from Zh. Ushnykh, Nosovykh i Gorlovykh Bolezney (Kiev), no. 5, Sep. - Oct. 1984 p 9-15 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

N85-19618# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF FUNCTIONAL MOBILITY OF HUMAN NERVOUS SYSTEM WITH THE PNN-3 INSTRUMENT Abstract Only
N V. Makarenko, N. V. Kolchneko, and Yu. L. Maydikov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 18 Transl. into ENGLISH from Zh. Vyssh. Nervnoy Deyatelnosti imeni I. P. Pavlova (Moscow), v. 34, no. 5, Sep. - Oct. 1984 p 972-974 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

N85-19619# Joint Publications Research Service, Arlington, Va.
VARIABILITY OF CARDIAC RHYTHM DURING INFORMATION LOADING Abstract Only
A. I. Stankus and Ye. N. Sokolov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 19 Transl. into ENGLISH from Fiz. Cheloveka (Moscow), v. 10, no. 5, Sep. - Oct. 1984 p 852-858 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

N85-19623# Joint Publications Research Service, Arlington, Va.
ELECTROSLEEP THERAPY ADVANCED AT MEDICAL INSTITUTE Abstract Only
In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 29 Transl. into ENGLISH from Med. Gazeta (Moscow), 7 Dec. 1984 p 3 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

N85-19626# Joint Publications Research Service, Arlington, Va.
BE HEALTHY, PILOT
A. Potapenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-009) 19 Feb. 1985 p 1-2 Transl. into ENGLISH from Leningr. Pravda (Leningrad), 24 Nov. 1984 p 4 (For primary document see N85-19625 10-51)
Avail: NTIS HC A04/MF A01

N85-19659# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
TOLERANCE, FATIGUE, PHYSIOLOGICAL AND PERFORMANCE EFFECTS OF SUSTAINED AND OSCILLATING LATERAL ACCELERATIONS
R. E. VanPatten *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 6 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

N85-19660# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
ANALYSIS OF THE TRANSIENT RESPONSE OF TEMPORAL ARTERY BLOOD FLOW DATA RELATIVE TO VARIOUS ANTI-G SUIT PRESSURE SCHEDULES
Richard J. Crosbie *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 11 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-19640*# Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Research Office.
RESEARCH OPPORTUNITIES IN HUMAN BEHAVIOR AND PERFORMANCE
Julien M. Christensen, ed. and John M. Talbot, ed. Jan. 1985 77 p refs
(Contract NASw-3924)
(NASA-CR-175473; NAS 1.26:175473) Avail: NTIS HC A05/MF A01 CSCL 05I

Extant information on the subject of psychological aspects of manned space flight are reviewed; NASA's psychology research program is examined; significant gaps in knowledge are identified; and suggestions are offered for future research program planning. Issues of human behavior and performance related to the United States space station, to the space shuttle program, and to both near and long term problems of a generic nature in applicable disciplines of psychology are considered. Topics covered include: (1) human performance requirements for a 90 day mission; (2) human perceptual, cognitive, and motor capabilities and limitations in space; (3) crew composition, individual competencies, crew competencies, selection criteria, and special training; (4) environmental factors influencing behavior; (5) psychosocial aspects of multiperson space crews in long term missions; (6) career determinants in NASA; (7) investigational methodology and equipment; and (8) psychological support. A.R.H.

N85-19641# Naval Submarine Medical Research Lab., Groton, Conn.
INDIVIDUAL DIFFERENCES IN CHROMATIC BRIGHTNESS MATCHING Interim Report
S. M. Luria and D. F. Neri 3 Oct. 1984 17 p
(AD-A148882; AD-E850 737; NSMRL-1031) Avail: NTIS HC A02/MF A01 CSCL 20/6

Individual differences in brightness matches between lights of different colors were determined for color-normal observers at both

photopic and mesopic light levels using the method of flicker photometry. The standard deviations of the settings made by 52 observers at photopic levels did not exceed 0.1 log unit. Variability was greatest at the extremes of the spectrum. Variability was not appreciably increased at mesopic levels. GRA

N85-19642# Naval Submarine Medical Research Lab., Groton, Conn.
THE RELATIVE EFFECTIVENESS OF RED AND WHITE LIGHT FOR SUBSEQUENT DARK-ADAPTATION Interim Report
S. M. Luria and D. A. Kobus 3 Jul. 1984 25 p
(AD-A148883; AD-E850737; NSMRL-1036) Avail: NTIS HC A02/MF A01 CSCL 06/16

The literature concerning the effectiveness of red and white light for permitting subsequent dark-adaptation is reviewed. Although red light is clearly superior to white, its advantage decreases as intensity decreases, and at levels of ambient light found in submarine compartments, its superiority over white is probably not of practical significance in most situations. Considering the disadvantages of red light, it is concluded that low level white light is preferable to red light as general night-time ambient illumination. GRA

N85-19643# Clemson Univ., S.C. Dept. of Psychology.
MULTIPLE RESOURCES AND BRAIN LATERALITY Final Report, 1 May 1983 - 1 May 1984
E. H. Galluscio 6 Jun. 1984 24 p
(Grant AF-AFOSR-0155-83)
(AD-A148912; AFOSR-84-1125TR) Avail: NTIS HC A02/MF A01 CSCL 06/16

Two studies were completed to test the multiple resources model of information processing using tachistoscopic lateralized-input techniques. In Exp. 1 37 normal, dextral subjects, 18 men aged 18-21 yr. and 19 women 18-21 yr. responded manually to a visuo-spatial and verbal dual-task presented simultaneously to left and right brain or non-laterally. Both men and women tended to have superior performance with coherent lateral input. However, differences in task difficulty and the possibility of a left to right scanning advantage with lateral input made interpretation of the data tenuous. In the second experiment the difficulty of the two tasks were made more equal and a third viewing condition, having noncoherent lateral input, was included. Twenty normal, dextral subjects 10 men aged 18-21 yr, and 10 women 19-21 yr. were tested under all three viewing conditions. Both men and women had superior performance with coherent lateral input compared to the other two viewing conditions. The results were viewed as supporting the notion that each hemisphere has separate and unique pools of resources, that the resources of one or both hemispheres may be functional in processing a given task, and that in dual-task situations the brain operates most efficiently accurately with direct access of appropriate tasks to each hemisphere. Author (GRA)

N85-19644# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
SELECTING ONE AMONG THE MANY: A SIMPLE NETWORK IMPLEMENTING SHIFTS IN SELECTIVE VISUAL ATTENTION
C. Koch and S. Ullman Jan. 1984 21 p
(Contract N00014-80-C-0505)
(AD-A148989; AD-E301513; AI-M-770) Avail: NTIS HC A02/MF A01 CSCL 05/10

This study addresses the question of how simple networks can account for a variety of phenomena associated with the shift of a specialized processing focus across the visual scene. We address in particular aspects of the dichotomy between the preattentive-parallel and the attentive-serial modes of visual perception and their hypothetical neuronal implementations. Specifically, we propose the following; (1) a number of elementary features, such as color, orientation, direction of movement, disparity etc. are represented in parallel in different topographical maps, called the early representation; (2) there exists a selective mapping from this early representation into a more central representation, such that at any instant the central representation contains the properties of only a single location in the visual scene, the selected location; (3) we discuss some selection rules that determine which location will be mapped into the central representation. The major rule, using the saliency or conspicuity of locations in the early representation, is implemented using a so-called winner-take-all network. A hierarchical pyramid-like architecture is proposed for this network. We suggest possible implementations in neuronal hardware, including a possible role for the extensive back-projection from the cortex to the LGN. GRA

N85-19645# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
ANALYSIS OF A VISUAL PERFORMANCE EXPERIMENT
Robert Clear and Samuel Berman Jul. 1984 25 p refs Presented at the Illum. Eng. Soc. Ann. Conf., St. Louis, 6-9 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000710; LBL-17763; CONF-840817-2) Avail: NTIS HC A02/MF A01

The Smith-Rea check value verification experiment was reanalyzed. This experiment is one of the 20 experiments used to support the CIE 19/2 model. A preliminary data sheet from Smith and Rea listed an incorrect score function and contained a large number of arithmetic errors in converting raw times to scores. Correction of these errors changes the CIE fit. It is argued that the W123 parameter of this fit is not related to the critical visual processes as claimed. The corrected data are used to examine basic trends. Subjects achieved their maximum scores for a large fraction of runs under all visibility conditions. There was no statistically significant difference in scores for tests from 100 to 5000 lux. Furthermore, illumination level was less important to performance than the other variables studied: subject, practice, and check set (legibility and contrast). The RQQ no. 6 recommended illumination levels for such tasks range from 200 to 750 lux, indicating that recommended levels may overstate the need for illumination. DOE

N85-19620# Joint Publications Research Service, Arlington, Va.
STUDY OF COGNITIVE STYLES OF STUDENTS IN AUTOMATED TEACHING SYSTEM Abstract Only
Tatyana Aleksandrovna Brutsentsova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 19-20 Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, Jul. - Aug. 1984 p 70-76 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

N85-19621# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL ROLE OF TYPE OF PERSON'S TEMPERAMENT IN INDIVIDUAL AND MUTUAL ACTIVITY Abstract Only
Valeriy Vladimirovich Belous *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 20 Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, Jul. - Aug. 1984 p 102-107 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

N85-19622# Joint Publications Research Service, Arlington, Va.
DIALOG SYSTEM OF PREPARATION AND PRESENTATION OF VISUAL INFORMATION Abstract Only
Aleksey Pavlovich Kulaichev, Dina Mikhaylovna Ramendik, and Mariya Valeryevna Slavutskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 20 Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, Jul. - Aug. 1984 p 118-120 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

N85-19624# Joint Publications Research Service, Arlington, Va.
RESTRUCTURING OF THE PROCESS OF VISUAL RECOGNITION AS PERCEPTION CONDITIONS ALTER Abstract Only
V. M. Krol and Ye. I. Bondar *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-011) 26 Feb. 1985 p 70 Transl. into ENGLISH from Zh. Vyssh. Nervnoy Deyatelnosti imeni

I. P. Pavlova (Moscow), v. 34, no. 5, Sep. - Oct. 1984 p 975-977 (For primary document see N85-19616 10-51)
Avail: NTIS HC A05/MF A01

N85-19627# Joint Publications Research Service, Arlington, Va.
METHODS OF MONITORING MENTAL WORK EFFICIENCY, EMOTIONAL ACTIVITY
K. R. Stavitskiy and N. A. Gosudarev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-009) 19 Feb. 1985 p 22-26 refs Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 11, Nov. 1984 p 48-49 (For primary document see N85-19625 10-51)
Avail: NTIS HC A04/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-19646*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
IMPROVEMENT OF WORKLOAD ESTIMATION TECHNIQUES IN PILOTING TASKS Final Report, 1 Feb. 1983 - 14 Mar. 1984
Walter W. Wierwille Mar. 1984 14 p refs
(Grant NAG2-17)
(NASA-CR-174374; NAS 1.26:174374) Avail: NTIS HC A02/MF A01 CSCL 05H

The Modified Cooper-Harper (MCH) scale has been shown to be a sensitive indicator of workload in several different types of aircrew tasks. The MCH scale, which is a 10 point scale, and five newly devised scales were examined in two different aircraft simulator experiments in which pilot loading was treated as an independent variable. The five scales included a 15 point scale, computerized versions of the MCH and 15 point scales, a scale in which the decision tree was removed, and one in which a 15 point left-to-right format was used. The results indicate that while one of the new scales may be more sensitive in a given experiment, task dependency is a problem. The MCH scale on the other hand exhibits consistent sensitivity and remains the scale recommended for general use. The MCH scale results are consistent with earlier experiments also. The results of the rating scale experiments are presented and the questionnaire results which were directed at obtaining a better understanding of the reasons for the relative sensitivity of the MCH scale and its variations are described. R.S.F.

N85-19647# Computer Technology Associates, Inc., Englewood, Colo.
SECTOR SUITE MAN-MACHINE FUNCTIONAL CAPABILITIES AND PERFORMANCE REQUIREMENTS Final Report
Ammerman, Ardrey, Bergen, Bruce, Fligg, Jones, Kloster, Lenorovitz, Phillips, and Reeves 10 Aug. 1984 410 p
(Contract DT-FA01-83-Y-10554)
(AD-A148881; FAA-AP-84-18; FR-4) Avail: NTIS HC A18/MF A01 CSCL 05/8

Sector Suite Man/Machine Functional Capabilities and Performance Requirements documents both the Sector Suite (SS) Man/Machine Interface (MMI) Functional Capabilities and the SS Workstation Functional Capabilities. Requirement specifications are defined for SS MMI application processes, user interface language, display management, resource management, error detection/recovery, data base update/retrieval and SS workstation hardware. The controller tasks defined in CDRL A002--Operations Concept for the AAS MMI are further decomposed into task elements which address data inputs and outputs, and task criticality and frequency. These task element statements are then used to derive SS functional requirements. This analysis provides the basis for a conceptual model of interaction, derives the functional capabilities and performance requirements for essential SS hardware and software functions, drives MMI processing capacity and response time requirements, and defines the requirements for MMI data bases and data base management. GRA

N85-19648# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
MAN-MACHINE INTERACTION: OPERATOR M.S. Thesis
Susan K. Harding Jun. 1984 54 p
(AD-A149075) Avail: NTIS HC A04/MF A01 CSCL 05/8

More people than ever before are using computers. Some use only the home computer while others use large mainframes or both. All computers have an interface with which the person must interact to operate the system correctly. This interface must be designed so that the operator can use the system without wasting time and money. This thesis describes some of the issues which should be considered when designing a man-machine interface, and defines some types of operators and their environments. The issues and their resolution are illustrated by a case study which describes the man-machine interface of an actual United States Navy system in use today. GRA

N85-19649# Human Engineering Labs., Aberdeen Proving Ground, Md.
GUIDE TO HUMAN FACTORS INFORMATION SOURCES Final Report
T. J. Wang Nov. 1984 42 p Sponsored by Army
(AD-A149102) Avail: NTIS HC A03/MF A01 CSCL 05/5

This guide shows how to search for literature relating to human factors. Manual and machine procedures are discussed in detail. Attention is directed to the development and location of sources of human factors expository material and human factors quantitative data. GRA

N85-19650# Auburn Univ., Ala.
CREWSTATION ASSESSMENT OF REACH AS APPLIED TO THE OH-58A HELICOPTER M.S. Thesis
M. G. Genetti 13 Dec. 1984 136 p
(AD-A149413) Avail: NTIS HC A07/MF A01 CSCL 01/3

A computer evaluation program, Crewstation Assessment of Reach (CARII), was utilized to determine the effectiveness of an evaluation designed for a single person workstation on a two person workstation. The workstation chosen for evaluation was the U.S. Army Helicopter OH-58A. To compensate for the multiple person workstation, the cockpit was defined from three points of view as follows: the pilot while flying, the copilot while flying and an observer in the copilots's station. Through an internal mechanism in the CAR program, a sample of link-men was generated from the means and standard deviations of twelve anthropometric measurements from the data of the 1970 survey of U.S. Army aviators. These link-men were then evaluated for their accommodation to the 24 controls defined in the workstation. Through the example of the relocation of one control, it was demonstrated that an evaluation tool such as CAR should be utilized in the design process. The problem of this study was to determine the effectiveness of the design of a two-person (shared) workstation by using a computerized evaluation method designed to evaluate the percent population accommodated by a single person workstation. GRA

N85-19651# Department of the Navy, Washington, D. C.
SERVO OPERATED ANTI-G SUIT PRESSURIZATION SYSTEM Patent Application
R. J. Crosbie and P. R. Edwards, inventors (to Navy) Filed 22 May 1984 17 p
(AD-D011468; US-Patent-Appl-SN-613497) Avail: NTIS HC A02/MF A01 CSCL 06/17

A servo operated system for controlling pressurization of an aircraft pilot's anti-G suit during high energy maneuvers has a servo operated control valve and a feedback loop controller for minimizing pressure lag in the suit. The controller has dual modes of operation: one for normal flight conditions and one for combat flight conditions. The normal flight mode provides nominal G-protection while the combat mode provides faster response by prepressurizing the anti-G suit to a bias level and lowering the G-force threshold. While in the combat mode, the crewman may select an

adjustable pulsating signal to be superimposed on the pre-pressurization level to obtain additional comfort. Alternatively, he may select a superimposed pulsating signal which is synchronized with his own heartbeat to reinforce the pumping action of the heart. GRA

N85-19652# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
HEAT STRESS AND PERSONAL PROTECTIVE EQUIPMENT
B. W. Huntsman Aug. 1984 28 p refs Presented at the DOE and DOE Contractors' Occupational Safety and Health Conf., San Diego, Calif., 11 Sep. 1984
(Contract DE-AC07-76ID-01570)
(DE85-003552; EGG-M-16684; CONF-840963-5) Avail: NTIS HC A03/MF A01

The use of personal protective equipment (PPE) in the radiological environment often restricts the body's natural ability to dissipate heat. The basic physiology of heat stress and strain, the use of PPE in accentuating heat stress, and a proposed heat stress program are discussed. DOE

N85-19653# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
HUMAN FACTORS CONSIDERATIONS IN HIGH PERFORMANCE AIRCRAFT
Loughton, England Nov. 1984 197 p refs In ENGLISH and FRENCH Symp. held in Williamsburg, Va., 30 Apr. - 2 May 1984
(AGARD-CP-371; ISBN-92-835-0368-6) Avail: NTIS HC A09/MF A01

The physical and mental demands placed on the crews of combat aircraft are severe now and are projected to increase in severity in the next five to fifteen years. Human factors needs, promises and practices to design future aircraft systems to ameliorate the physical stressors and mental workload of the crew are addressed. Future mission requirements, emerging technologies, and findings from research on physiological and cognitive processes and methodology are discussed. For individual titles, see N85-19654 through N85-19672.

N85-19654# Smiths Industries Ltd., Bishops Cleeve (England).
AIRCREW AND AVIONICS: FRIENDS OR FOES?
R. A. Chorley *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 9 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

The Proliferation of display devices has led to a situation where the complexities of the visual task of acquiring essential information from large numbers of displays, and of providing inputs to the system through large numbers of controllers, are only marginally acceptable. Means are now becoming available to ease this situation. Efforts to design aircrew-friendly avionics systems in an attempt to reduce pilot workload are discussed. Multifunction displays and controllers and facilities, such as direct voice input and speech output are all potentially capable of making avionics systems more efficient. B.W.

N85-19655# Army Research Inst. Field Unit, Fort Benning, Ga.
MILITARY PILOT ERGONOMICS
Irving C. Statler *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 13 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

The problem facing virtually all modern military command and control systems is processing and selection among increasingly large amounts of information. Poor system design or excessive mission demands result in high operator workload. A crew workload problem exists in today's tactical military aircaft that can contribute to mission failure or loss of pilot and aircraft. Examples of current designs in which it appears that design engineers have not understood or have ignored fundamental requirements of human sensory and cognitive characteristics and limitations are discussed. Background information to the current problem of the man-machine interface in the tactical military aircraft is provided and current approaches to achieving increased mission performance are discussed. B.W.

N85-19656# Department of the Air Force, Wright-Patterson AFB, Ohio. F-16 System Program Office.
IMPLICATIONS OF GUIDANCE AND CONTROL TECHNOLOGY ON HUMAN FACTORS CONSIDERATIONS
Robert C. Ettinger *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 13 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

Emerging technologies in guidance and control which are candidates for future aircraft are discussed. An advanced development program which successfully demonstrated Integrated Fire/Flight Control (IFFC) technology to automatically deliver air-to-air and air-to-surface weapons while maneuvering is described. The advanced cockpit design of the new F-16 C/D aircraft is also described. Brief descriptions of normal acceleration of G induced loss of consciousness, anti-G hardware and pilot G tolerance in the F-16 are also covered. Lastly, the angle of attack and load factor limiting features of the F-16 and how they affect the maneuvering of this relaxed static stability, fly-by-wire, high performance aircraft are described in detail. B.W.

N85-19657# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Human Engineering Dept.
OBSERVATIONS OF PHYSIOLOGICAL AND PSYCHOLOGICAL EFFECTS OF TERRAIN FOLLOWING FLIGHT BASED ON IN-FLIGHT TEST EXPERIENCE
F. Koehl and D. Seeck (Messerschmitt-Boelkow-Blohm G.m.b.H., Manching, West Germany) *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 8 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

A short description of the PANAVIA 200 TORNADO TF-System, Displays and Controls is given. The physiological and psychological effects including monitoring and workload aspects during the current TORNADO TF test flying described are a result of interviewing aircrews with a wide variety of individual operational experience. Crew interviews revealed this task to be a high load on the aircrew. Load is a combination of physical and psychic parts, depending on environmental factors and flight conditions. Crew system confidence is acquired through step by step progression to lowest height and from visual meteorological conditions (VMC) to instrument meteorological conditions (IMC)-Terrain Following and will be the base for later services operational pretraining. No pathogenic influences have been observed up to now. B.W.

N85-19658# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PERSONNEL PROTECTION CONCEPTS FOR ADVANCE ESCAPE SYSTEM DESIGN **c03**
James W. Brinkley *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 12 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

The severe emergency escape conditions associated with low-altitude and high-speed environments are often beyond the performance capabilities of contemporary ejection seats. A new escape system design approach is needed to extend the performance envelope without increasing the stresses imposed on the ejecting crewmembers. A new approach was developed and specific ejection-seat subsystem design technologies are being explored by the United States Air Force. The central concept of the approach is the automatic selection of the performance characteristics of the escape system based on the conditions that exist at the time of ejection, and the adaptive control of the escape-system performance throughout the escape episode. Ejection-seat subsystem design concepts being developed to implement this approach are summarized. Several crew-protection concepts are reviewed, including a method to control the risk of injury to be proportional to the life threat of specific escape

conditions and a windblast protection device called the flow-stagnation fence. A means to provide real-time assessment and control of the accelerations imposed on an ejection seat's occupant is vital to the new escape system design approach. A six-degree-of-freedom acceleration exposure-limit method currently being developed to meet this requirement is presented. Author

N85-19659# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
TOLERANCE, FATIGUE, PHYSIOLOGICAL AND PERFORMANCE EFFECTS OF SUSTAINED AND OSCILLATING LATERAL ACCELERATIONS c52
R. E. VanPatten *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 6 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

The advent of six degree of freedom aircraft such as the AFTI/F-16 prompted performance oriented research on the effects of sustained and oscillating lateral acceleration (+ or - Gy). The literature of classical tolerance research in lateral acceleration is reviewed as a basis for the recent centrifuge research performed at the Air Force Aerospace Medical Research Laboratory. Issues of pilot restraint, biodynamic control cross-coupling, fatigue, body positioning, and pilot performance sensitivity to lateral acceleration are discussed. Results are presented in the context of operational cockpit requirements with implications for the design and performance of future six degree of freedom fighter aircraft. Author

N85-19660# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
ANALYSIS OF THE TRANSIENT RESPONSE OF TEMPORAL ARTERY BLOOD FLOW DATA RELATIVE TO VARIOUS ANTI-G SUIT PRESSURE SCHEDULES c52
Richard J. Crosbie *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 11 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

A method is presented for objectively measuring the relative effectiveness of various G protective equipment or techniques by comparing the quantitative response of a subject's mean Doppler flow velocity signal to a series of modest G profiles when using each protective system in turn. The method is applied to evaluate two configurations of the Navy's new servo controlled anti-G valve in comparison with the standard ALAR valve during exposure to G profiles having various rates of G onset. Author

N85-19661# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensgruppe Hubschrauber und Flugzeuge.
IMPACT OF FUTURE AIRCOMBAT CHARACTERISTICS ON PILOT PERFORMANCE AND COCKPIT DESIGN
Klaus-D. Richter *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 15 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

Future medium - and short-range weapons are expected to change aircombat characteristics significantly. Medium-range (MR) weapon technology and performance will force a supersonic maneuvering type aircombat with sustained energy as well as highly dynamic character in terms of climb/descent rates and spatial position changes. All-respect capabilities of new short-range (SR) weapons will establish their employment from head-on, at least frontal hemisphere positions. The SR-aircombat is characterized by instantaneous maneuvering and is drifting to lower speeds and lower loadfactor levels. A high acceleration/reclined seat cockpit seems not necessary, if fighter design requirements are observed. The MR head-down aircombat is expected to influence pilot performance to a large degree and pose problems concerning spatial disorientation; manual versus automatic maneuvering, degree of automation; and aircraft performance monitoring and mental processing of tactical situation information. Solution requirements are postulated to divide human and system tasks. System automation and integration is discussed to reduce pilot workload and create a time margin for qualified decision-making. A tactical Information & Command System is discussed and a tactical display layout proposed. Author

N85-19662# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
GRASP OF INFORMATION BY THE PILOT IN FUTURE COMBAT AIRCRAFT [PRISE D'INFORMATION PAR LE PILOTE DANS LES AVIONS DE COMBAT FUTURE]
Guy Santucci, Claude Valot, Rene Amalberti, and Jean-Pierre Menu *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 7 p refs In FRENCH (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

Future combat aircraft will be complex systems. The management of such a system imposes a much more important workload which should be carried out under intense psychological constraints. There is risk of surpassing the pilot's capacities. To alleviate this, a computer would be added to the pilot's equipment. The division of tasks between these two partners, and the dialog between them, posses problems that must be defined before their solution can be found. The first of these problems must be psychological and physiological simultaneously, and of an intricate type. This approach is developed. Transl. by A.R.H.

N85-19663# Defence Centre for Leadership, Copenhagen (Denmark). Aviation Psychology Branch.
CONCEPTUAL MODEL OF CRITICAL REQUIREMENTS FOR EFFECTIVE PILOT PERFORMANCE IN HIGH PERFORMANCE AIRCRAFT
J. Termohlen *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 8 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

The conceptual model of critical job requirements of the operational Air Force pilot was updated through an interview study. Participants were pilots of varying flying experience and ranking from colonel to lieutenant. In addition, crew members and air traffic controllers were interviewed. The critical incident techique was used. Participants were asked to relate actual incidents demonstrating effective or ineffective pilot behavior. A total of 153 persons were interviewed; they contributed 444 incidents. Data analysis resulted in the formulation of the following action or trait categories and subcategories: (1) action power and competence (capacity, alertness, independence and will power, decisiveness, coolness); (2) knowing one's limitations and attempting not to exceed them; (3) dependability (admitting mistakes, responsibility, honesty); (4) leadership; (5) self-discipline; (6) social function and team work. The results are to be utilized in policy making by various command and management levels and training of flight instructors, students, and officer candidates. R.S.F.

N85-19664# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
ELECTRONIC DISPLAYS: THEIR STRENGTHS AND WEAKNESSES FOR ADVANCED HIGH PERFORMANCE AIRCRAFT c06
Harry L. Snyder and R. H. Bogle *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 11 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

Various aircraft cockpit display technologies are compared on the basis of maximum size, maximum spatial resolution, available colors, luminance, and luminance range. The specific technologies considered are CRT, plasma discharge, electroluminescent, liquid crystal, electrochromic, and light emitting diode. The technological parameters of the cockpit displays are discussed with respect to visual task compatibility and flight crew needs and performance. R.S.F.

N85-19665# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
CHANGING SYSTEM AND DISPLAY CONCEPTS AND THEIR

IMPACT ON AIRCREW PERFORMANCE
V. P. Schmit *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 11 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

Future aircraft equipment fits and flight profiles are threatening to overload the operator's ability to accept and process the information presented to him, as direct results of an increase in information volume and a reduction in time available. It is assumed that, for the foreseeable future, the primary modality for information display in the cockpit should remain visual, while control inputs to the system will be mutable in modality. A number of topics relating to visually displayed information are considered: (1) visual search and system location cueing; (2) design of spatial location cueing symbology; (3) selective attention and display coding conventions; (4) design procedures for new tactical symbology; (5) information integration in flight information displays; and (6) the costs of attention switching in the flying task. Some new tactical information display concepts are discussed, and areas of research necessary to support future aircraft displays and systems are highlighted. R.S.F.

N85-19666# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
SOME EFFECTS OF DISPLAY FORMAT VARIABLES ON THE PERCEPTION OF AIRCRAFT SPATIAL ORIENTATION
R. M. Taylor *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 14 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

Aircraft head-up display (HUD) standardization should be guided by empirical evidence from studies of operator performance. The effects of HUD pitch scale design variables on pitch and roll recovery tasks were evaluated in four experiments. Design variables are identified that have significant effects on decision making performance. Recommendations are made for HUD pitch scale standardization. The findings are discussed in terms of cognitive processes involved in the perception of complex multidimensional visual stimuli. R.S.F.

N85-19667# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
THE COCKPIT OF THE YEAR 2000: HOW BIG A STEP?
John M. Reising and Terry J. Emerson *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 4 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

The cockpit of the year 2000 is envisioned to be dramatically different from those of current fighter aircraft. The upcoming hardware and software available in the mid 1990s are discussed together with the impact on the pilot of having them available for use. Among the advanced technologies considered are electro-optic displays, voice control, touch sensitive overlays, programmable switches, helmet mounted displays, and artificial intelligence software. R.S.F.

N85-19668*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFLUENCE OF A PERSPECTIVE COCKPIT TRAFFIC DISPLAY FORMAT ON PILOT AVOIDANCE MANEUVERS
Stephen R. Ellis, Michael W. McGreevy, and Robert J. Hitchcock (San Jose State Univ.) *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 9 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01 CSCL 05H

Perspective projections of cockpit displays of traffic information (CDTI) on CRTs to present vertical separation information to airline pilots were examined. The perspective projection was compared with plan view projections of the same air traffic situations. Comparison of the pilots' avoidance maneuvers made when using the perspective display with those made while using more the conventional plan view display showed that pilots maneuvered somewhat earlier with perspective displays. With the perspective display, they maneuvered more frequently in the vertical dimension. The bias to maneuver horizontally probably reflected the poorer presentation of vertical separation on previously used plan view traffic displays. The avoidance decisions made by pilots using both perspective and plan view displays shows fewer unsuccessful maneuvers and fewer maneuvers producing spacing violations with the perspective format. E.A.K.

N85-19669# Illinois Univ., Urbana-Champaign. Inst. of Aviation.
THE MULTIPLE RESOURCES MODEL OF HUMAN PERFORMANCE: IMPLICATIONS FOR DISPLAY DESIGN
Christopher D. Wickens *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 6 p (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

Three cognitive principles of display design proposed within the framework of the multiple resources model of human performance are described. These principles are: (1) stimulus central processing compatibility describing the optimum association of display format, to the working memory code used in performance of a task; (2) resource competition, describing how the optimum configuration for displaying two or more sources of task information is to employ separate resources; and (3) task integration, a principle that constrains the application of the resource competition when separate stimulus elements must be integrated into a single mental model for the task. Five experiments are described that investigate these principles in isolation and in different combinations in aviation related tasks. The data generally support all three principles, and indicate that compatibility is a dominant concept when placed in opposition with resource competition. E.A.K.

N85-19670*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PILOT WORKLOAD, PERFORMANCE AND AIRCRAFT CONTROL AUTOMATION
Sandra G. Hart and Thomas B. Sheridan (MIT, Cambridge, Mass.) *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 12 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01 CSCL 05H

Conceptual and practical issues associated with the design, operation, and performance of advanced systems and the impact of such systems on the human operators are reviewed. The development of highly automated systems is driven by the availability of new technology and the requirement that operators safely and economically perform more and more activities in increasingly difficult and hostile environments. It is noted that the operators workload may become a major area of concern in future design considerations. Little research was done to determine how automation and workload relate to each other, although it is assumed that the abstract, supervisory, or management roles that are performed by operators of highly automated systems will impose increased mental workload. The relationship between performance and workload is discussed in relation to highly complex and automated environments. E.A.K.

N85-19671# Naval Air Development Center, Warminster, Pa.
THE F-18: A NEW ERA FOR HUMAN FACTORS
Stephen C. Merriman and Julian P. Moore (McDonnell Douglas Corp., St. Louis) *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 5 p (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01

The crew station of the Navy/Marine Corps' newest high performance tactical jet aircraft - the F/A-18 HORNET and the human factors effort involved in its development and testing are described. The F/A-18 represents the first of a new generation of military aircraft. Its development posed a host of novel man machine interface, crew station design and human factors engineering problems in need of creative solutions. Compared to other tactical jet aircraft currently serving the military, the F/A-18 is, by design, the most mission flexible and growth accommodating aircraft in the inventory. To develop the HORNET major changes

in the human factors engineering approach were required. Involved are: thorough mission analyses, technology risk assessment and a step-by-step process of proof or concept in realistic mission simulators. E.A.K.

N85-19672# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRCREW-AIRCRAFT INTEGRATION ISSUES IN FUTURE US ARMY HELICOPTERS
E. James Hartzell, Edwin W. Aiken, and James W. Voorhees *In* AGARD Human Factors Considerations in High Performance Aircraft Nov. 1984 16 p refs (For primary document see N85-19653 10-54)
Avail: NTIS HC A09/MF A01 CSCL 05H

Some human factors research issues, the resolution of which will be vital to the successful operation of future military helicopters are reviewed. Understanding and reducing the helicopter pilot's workload is examined by a diverse program directed at answering some of the more fundamental questions relating to the transfer displays and interactions between pilot and automated systems. The results of three experimental studies which address the issues of display control compatibility, characteristics of integrated controllers, and voice systems are presented. E.A.K.

N85-19606# Joint Publications Research Service, Arlington, Va.
WORK PHYSIOLOGY OF OPERATING PERSONNEL AT POWER PLANTS IN ARID REGIONS Abstract Only
I. M. Mommadov, A. G. Grigoryan, and G. A. Tupikova *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 22 Transl. into ENGLISH from Gigiyena Tr. i Prof. Zabolevaniya (Moscow), no. 10, Oct. 1984 p 50-51 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

N85-19608# Joint Publications Research Service, Arlington, Va.
EFFECTS OF OVERALL VIBRATION AND NOISE ON OPERATIONAL PERSONNEL Abstract Only
Yu. N. Kamenskiy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-008) 13 Feb. 1985 p 24 Transl. into ENGLISH fromm Gigiyena Tr. i Prof. Zabolevaniye (Moscow), no. 10, Oct. 1984 p 38-39 (For primary document see N85-19605 10-51)
Avail: NTIS HC A05/MF A01

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N85-19673# Suomalainen Tiedeakatemia, Helsinki (Finland).
ANNUALS OF THE FINNISH ACADEMY OF SCIENCES, SERIES A. 1: MATHEMATICS, VOLUME 8, PART 2 [ANNALES ACADEMIEAE SCIENTIARUM FENNICAE, SERIES A. 1: MATHEMATICA, VOLUMEN 8, FASCICULUS 2]
Olli Lehto, ed. (Helsinki Univ.) Hungary 1983 200 p refs In ENGLISH; partly in GERMAN
(ISSN-0066-1953) Copyright. Avail: Issuing Activity

Articles addressing various topics in mathematics are presented. Subject areas include quasiconformal and quasiregular mappings, analytic functions, rotation automorphic functions, non-hypoelliptic Dirichlet problems and differential operators. For individual titles, see N85-19674 through N85-19687.

N85-19674# Freie Univ., Berlin (West Germany).
TOWARDS THE CONSTRUCTION OF PERIODIC SOLUTIONS OF PSEUDODIFFERENTIAL EQUATIONS WITH THE AID OF ALGEBRAIC OPERATORS [ZUR KONSTRUKTION PERIODISCHER LOSUNGEN VON PSEUDODIFFERENTIALGLEICHUNGEN MIT HILFE VON OPERATIORENALGEBREN] c64
Karl Doppel and Niels Jacob *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 193-217 refs In GERMAN (For primary document see N85-19673 10-59)
Avail: Issuing Activity

Elliptic and hypoelliptic algebraic operators are defined for obtaining periodic solutions of associated pseudodifferential equations. The algebra A(sup infinity)(zeta *) is described and extended to the Hilbert space H(zeta *)sup r (Q). Examples are given and the zeta *-elliptic operator is applied to the extension of the Gardingshe inequality. Transl. by M.G.

N85-19675# San Diego State Univ., Calif. Dept. of Mathematics.
DOMAINS WITH LIPSCHITZ MAPPING FUNCTIONS c64
Frank David Lesley *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 219-233 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

Suppose that gamma is a closed Jordan curve in the omega plane, with interior omega and exterior omega*. Let f and f* respectively be conformal mappings of D = (absolute value zeta <1) and D* (absolute value zeta>1) onto omega and omega*. Both f and f* may be extended to homeomorphisms between the closures of their domains and images, and we denote these extensions by f and f* also. It is a much studied phenomenon that various geometric properties of gamma correspond to properties of the mapping functions or their inverses. In particular, there are many results in which properties of gamma imply properties of the mapping functions. There are fewer where one assumes properties of the functions to infer properties of gamma, and there are still fewer equivalences between behavior of gamma and boundary behavior of f or f*. In some cases, a condition of f alone (for example) is equivalent to a condition on gamma. The consequences of Lipschitz continuity on delta-D of the mapping functions are examined. M.G.

N85-19676# Helsinki Univ. (Finland). Dept. of Mathematics.
ON THE SPHERICAL DERIVATIVE OF A MEROMORPHIC FUNCTION WITH A NEVANLINNA DEFICIENT VALUE c67
Sakari Toppila *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 235-245 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

Theorems concerning the spherical derivative of a meromorphic function are proved utilizing the notations of the Nevanlinna theory. M.G.

N85-19677# Helsinki Univ. (Finland). Dept. of Mathematics.
SIMPLIFIED PROOFS OF SOME BASIC THEOREMS FOR QUASIREGULAR MAPPINGS c67
Marthi I. Pesonen *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 247-250 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

Proofs for three well-known theorems in the theory of quasiregular mappings are presented. The first theorem states that the condition (N) is satisfied, i.e., if A is a subset of G and m(A)=0, then m(fA)=0; moreover m (fB sub f)=0. the second theorem posits that the transformation formula [integral (sub E) (hof)J(sub f)dm = integral (sub R sup n) h(y)N(y,f,E)dm(y)] holds whenever h:R sup n approaches [0, infinity] and (E is a subset of G) are measureable. The final theorem holds that for a.e (x is an element of G), J(sub f)(x) does not equal 0; consequently m(B sub f)=0. In these theorems f denotes a non-constant n-dimensional quasiregular mapping of a domain (G is a subset of R sup n) into R sup n. M.G.

N85-19678# Helsinki Univ. (Finland). Dept. of Mathematics.
DIFFEOMORPHIC APPROXIMATION OF QUASICONFORMAL AND QUASISYMMETRIC HOMEOMORPHISMS **c64**
Maire Kiikka *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 251-256 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

Piecewise linear approximations for quasiconformal, bi-Lipschitz and quasisymmetric embeddings have been constructed by Carleson, Vaisala, Kiikka, and by Luukkainen and Tukia. A result of Munkres is applied to smooth these approximations into C(infinity)-embeddings in the homeomorphic case. By a theorem of Lehto and Virtanen's every finite K-quasiconformal mapping in dimension 2 is locally the limit of a sequence of regular K-quasiconformal C(omega)-mappings. M.G.

N85-19679# Warsaw Univ. (Poland). Dept. of Mathematics.
ANALYTICAL FOUNDATIONS OF THE THEORY OF QUASICONFORMAL MAPPINGS IN Rn **c67**
B. Bojarski and T. Iwaniec *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 257-324 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

An exposition of basic analytical properties of quasiconformal (and quasiregular) mappings of n-dimensional domains is presented. Emphasis is given to revealing the interaction of general quasiconformal theory with partial differential equations, variational inequalities, differential geometry and analysis in general. The mappings are also discussed in regard to maximal functions and inverse Holder inequalities, continuity and differentiability, and capacity and Hausdorff measure estimates for quasiconformal mappings. M.G.

N85-19680# Karlsruhe Univ. (West Germany).
LOCALLY UNIVALENT FUNCTIONS IN THE UNIT DISK **c67**
Norbert Steinmetz *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 325-332 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

Let f be meromorphic and locally univalent in the unit disk D and denote by [f,z] = (f''/f')' - 1/2 (f''/f')sup 2 = 2q(z), the Schwarzian derivative of f. It is known that f admits the representation f = w(sub 1)/w(sub 2), where w(sub 1) and w(sub 2) are linearly independent solutions of the linear differential equation w'' + q(z)w = 0. The boundary behavior of f is investigated and theorems addressing monotonicity, normal functions, and conformal mapping are proved. M.G.

N85-19681# Open Univ., Milton (England). Dept. of Mathematics.
ON HARMONIC FUNCTIONS WITH INTEGRABLE MAXIMUM MODULUS **c64**
J. G. Clunie and P. J. Rippon *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 333-341 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

Regularity conditions on harmonic functions with integrable maximum modulus are addressed. An extension of the Riesz-Herglotz formula by Hayman and Korenblum is considered. M.G.

N85-19682# Stockholm Univ. (Sweden). Dept. of Mathematics.
CONDENSER CAPACITIES AND REMOVABLE SETS IN W1p1 **c65**
Torbjorn Kolsrud *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 343-348 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

The sets E in R sup d, (d > or = 2, closed, and of Lebesgue measure zero), which are removable for the Sobolev space W sup 1,p (1<p<infinity) are characterized. The sets are removable in the sense that W(sup 1,p) (R sup d/E)= W(sup 1,p)(R sup d). Vodopjanov and Goldshtein stated that this removability holds if and only if E is a null set for p-condenser capacities, or equivalently a null set for p-extremal length. A short proof based on a so-called strong-type capacitary estimate is presented. M.G.

N85-19683# Freie Univ., Berlin (West Germany).
CLOSE-TO-CONVEX FUNCTIONS AND LINEAR-INVARIANT FAMILIES **c67**
Wolfram Koepf *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 349-355 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

Landau showed in 1925 that in the class S of normalized Schlicht functions on the unit disk one can get a distortion theorem for the n-th derivative if the first n Bieberbach coefficient estimates are ensured to be correct. This result is modified for linear-invariant families. Families of close-to-convex functions and of functions of bounded boundary rotation are shown to be linear-invariant. M.G.

N85-19684# Mohammed V Univ., Rabat (Morocco).
ON THE INTEGRAL REPRESENTATION OF BISUBHARMONIC FUNCTIONS IN Rn **c67**
Victor Anandam *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 357-367 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

A summable function omega in R sup n, n > or = to 2, satisfying the condition Delta(2)omega > or = to, can be identified with the pair (omega, h) satisfying the conditions Delta omega = h and Delta h > or = to 0. Then h is an almost subharmonic function; and given that any Radon measure mu > or = to 0 in R sup n, one can construct a subharmonic function u with associated measure mu in the local Riesz representation, omega can be seen to be an almost Delta-subharmonic function. The properties of such functions (omega, h) were studied with a view to represent them in R sup n as integrals. It is shown that with every Delta-subharmonic function omega, one can associate a subharmonic function omega sup * and define the order of omega as that of omega sup *. Then, using the subharmonic function omega sup *, some integral representation theorems are given for omega and their relation with the Hadamard representation theorem for Delta-subharmonic functions in R(2) is explained. Making use of these results, one finally arrives at the integral representation of a bisubharmonic pair (omega, h). The details are given only in R(3). R.S.F.

N85-19685# Helsinki Univ. (Finland). Dept. of Mathematics.
SOLUTIONS OF PROBLEMS OF MILLER AND RUBEL **c67**
Sakari Toppila *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 369-370 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

W is assumed to be analytic in the absolute value of Z < 1 with w(o) = 0. It is shown that for all positive integers N, if the absolute value of [w (z) + zw'(z)+... + z (sup n)(w sup (n))(z)] < 1 for the absolute value of Z < 1, then the absolute value of W(z) < 1 for the absolute value of Z < 1. Two theorems which consider transcendental entire functions are presented and proofs provided. R.S.F.

N85-19686# Joensuu Univ. (Finland). Dept. of Mathematics and Physics.
ON ROTATION AUTOMORPHIC FUNCTIONS WITH DESCRETE ROTATION GROUPS **c67**
Rauno Aulaskari *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 371-373 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

It is assumed that some Fuchsian group Gamma is arbitrary and that the rotation group Sigma = (the set which contains S sub T where T is an element of Gamma) acting on a Riemann sphere is restricted. Because of the compactness of the Riemann sphere, it is shown that the condition sigma is discrete or the equivalent assumption Sigma is finite implies the normality of a

rotation automorphic function F. A theorem is presented in which f, Gamma, and the spherical derivative of f are considered. The concomitant proof is also provided. R.S.F.

N85-19687# Freie Univ., Berlin (West Germany).
A NON-HYPOELLIPTIC DIRICHLET PROBLEM FROM STOCHASTICS **c67**
Karl Doppel and Niels Jacob *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 375-389 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

A method which can be understood as a generalization of the Hilbert space methods used in the elliptic theory is applied to a study of Dirichlet problems for the operator L(D). Anisotropic Sobolev spaces which correspond in a natural way to the operator L(D) are utilized. For a domain G which is the Cartesian product of bounded open sets (G sub j is contained as a proper sub-class within R sup (m sub j)) (n = m sub 1 + ... +m sub k) with sufficiently smooth boundaries (curly d G sub j), it is shown that a generalized Dirichlet problem for which the solution is searched in such an anisotropic space has a unique solution. Theorems are presented and proven. R.S.F.

N85-19688*# Norfolk State Coll., Va.
MACSYMA USAGE AT LANGLEY
Sandra Jean DeLoatch Feb. 1985 69 p refs
(Contract NAS1-16921)
(NASA-CR-172518; NAS 1.26:172518) Avail: NTIS HC A04/MF A01 CSCL 12A

MACSYMA, a large and versatile symbolic manipulation system, is discussed in relation to its access and use at NASA, Langley Research Center. Introductory information for new users, descriptions of the available resources for new and experienced users, and illustrations of selected features of the MACSYMA computing environment are provided. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-19689# Committee on Science and Technology (U. S. House).
COMPUTERS AND EDUCATION
Washington GPO 1984 620 p refs Hearings before the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 98th Congr., No. 64, 28-29 Sep. 1983
(GPO-28-378) Avail: Subcommittee on Investigations and Oversight

Hearings were conducted and testimony heard from a variety of expert witnesses on the subject of integrating computers into all levels of the American educational system. Among the issues addressed were positive and negative impact, cost, teacher qualification, availability of suitable software, the ramifications of being able to keep students in pace with the expanding technology, and the use of computers in expanding the student's learning potential in areas other than those strictly associated with the hard sciences. Also considered were such questions as how should funds be distributed between hardware and software purchases, what is the best student/computer ratio, and what role if any should manufacturers and suppliers of the needed materials play in the training of teachers and the designing of curricula. G.L.C.

N85-19690# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A LOW-COST, GENERAL PURPOSE IMAGE PROCESSING SYSTEM
Gilberto Camara-Neto and Ricardo Cartaxo M. deSouza Oct. 1984 13 p refs Presented at the 4th Japan-Brazil Symp. on Sci. and Technol., Sao Jose dos Campos, Brazil, Aug. 1984
(INPE-3292-PRE/607) Avail: NTIS HC A02/MF A01

A low cost image processing system is described, which is designed to handle a great variety of image processing applications. The system incorporates current trends in both software and hardware development. The hardware consists of a Brazilian-built 16-bit microcomputer, a display unit (developed at INPE), and interfaces to various input/output devices. The software will contain application programs for a great variety of users, including: remote sensing, meteorology, microscope and biomedical images, as the building of a geographic information system. Future developments are also pointed out. Author

N85-19691# Committee on the Judiciary (U. S. House).
COMPUTER CRIME
Washington GPO 1984 83 p refs Hearings before the Subcomm. on Civil and Constitutional Rights of the Comm. on the Judiciary, 98th Congr., 1st Sess., 18 Nov. 1983
(GPO-30-544) Avail: Subcommittee on Civil and Constitutional Rights

Testimony addressing computer-related crime is presented and the question of the Federal interest in outlawing unauthorized use of private sector computer equipment or the information stored in computerized files is raised. The potential of computer technology and data exchange for jeopardizing the privacy rights or ownership interests of the individual users or subjects is also examined. M.G.

N85-19692# Imperial Software Technology Ltd., London (England).
DISTRIBUTED DATA PROCESSING DESIGN METHODOLOGY Final Technical Report
M. Dowson, G. LeLann, J. Kramer, J. Magee, and M. Sloman May 1984 102 p
(Contract DAJA45-83-C-0044)
(AD-A148888; AD-E850737) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report discusses approaches to the development of systematic methods for the design of robust real time distributed computer systems. The conclusion of the report outlines an evolutionary approach to the development of a true method for the design of distributed real time systems. It identifies two parallel threads of effort which need to be pursued. The first, developing a calculus of operational requirements, will provide a means of specifying and reasoning about the various requirements. Work in this area could best build on an existing method, progressively enhancing it to cope with the full range of distributed system requirements. The second thread consists of (relatively informal) experimentation with the method as it evolves, exploiting our current understanding and appreciation of the fundamental technical issues of distributed systems. This will feed back into the development of the method itself, by providing a better appreciation of the way in which operational requirements can be addressed. GRA

N85-19693# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
DISTRIBUTING A DISTRIBUTED PROBLEM SOLVING NETWORK SIMULATOR
Edmund H. Durfee, Daniel D. Corkill, and Victor R. Lesser May 1984 24 p
(Contract N00014-79-C-0439; Grant NSF MCS-78-04212)
(AD-A149065) Avail: NTIS HC A02/MF A01 CSCL 09/2

We describe our experience in improving the real-time performance of a particular large and complex simulator through distributed processing. Our goal was to both reduce the real time required and to increase the scope of the simulations by splitting the existing simulator (written in Lsip) to run on a network of VAX 11/750s connected by DECNet/ETHERNET-II. We present data showing that the additional CPU power and the combined physical memory available in the network contribute to significant real-time speedup. Experience with a two and three machine network indicates that there was no memory contention in a single process simulator, we obtain a speedup proportional to the number of processes. Where there was memory contention in the single process simulator, the speed up is much more dramatic. We also

detail the capabilities that were added to the conventional network communication structure to implement, debug, and interact with the distributed simulator. GRA

N85-19694# Naval Postgraduate School, Monterey, Calif. Dept. of Administration Sciences.
A DECISION MODEL FOR SELECTION OF MICROCOMPUTERS AND OPERATING SYSTEMS M.S. Thesis
Keith G. Highfill Jun. 1984 76 p
(AD-A149076) Avail: NTIS HC A05/MF A01 CSCL 09/2

A framework for the construction of an economic analysis model is suggested for the selection of microcomputer hardware and operating systems. The model is suggested in order to guide prospective Navy microcomputer systems. The model is designed such that common spreadsheet software programs can be utilized to manipulate the model and store data on available systems. In addition, comparisons are made of current popular microcomputer systems and operating systems, in order to provide a frame or reference for the use of the model. GRA

N85-19695# Georgia Inst. of Tech., Atlanta. Production and Distribution Research Center.
RELATIVE PERFORMANCE OF MICRO AND MAINFRAME COMPUTERS
M. Goetschalckx and Y. Bozer Sep. 1984 6 p
(Contract N00014-83-K-0147)
(AD-A149281; PDRC-84-11) Avail: NTIS HC A02/MF A01 CSCL 09/2

This article compares the relative performances of two typical operations research algorithms implemented on an IBM PC microcomputer and on a CDC Cyber 6400 mainframe computer. The basis of comparison is the computation time expressed in central processing unit seconds. The first algorithm performs exclusively integer operations, while the second algorithm performs primarily real arithmetic and transcendental functions. For the integer algorithm the speed ratio is 2.14 or 2.65 depending on the accuracy of the PC. For the real algorithm the speed ratio is 3.6. In general, the speed ratio is approximately equal to 3 to 1, which is extremely favorable for the microcomputer, considering the relative cost of CPU time on each machine. Author (GRA)

N85-19696# Federal Compiler Testing Center, Falls Church, Va.
DIGITAL EQUIPMENT CORPORATION VAX Ada COMPILER VERSION T0.6-2 VAX-11/785, 11/750, 11/730, USING VMS, VERSION 4.0 AND MICROVAX 1, USING MICROVMS VERSION 1.0
12 Sep. 1984 25 p
(AD-A149375; AD-F300533; TC-84-DEC-390) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Digital Equipment Corporation Compiler VAX Ada, version T0.6-2, for the VAX-11/785, 11/780, 11/750, 11/730 using VMS version 4.0 and MicroVAX 1 using MicroVMS version 1.0, was tested with version 1.4 of the ACVC validation tests. Version 1.4 of the test suite contained 2173 tests, of which 2099 were applicable to this implementation. Of the applicable tests, 11 were withdrawn due to errors in the tests. Of the remaining applicable correct tests 2099 passed and no anomaly was discovered. GRA

N85-19697# Naval Postgraduate School, Monterey, Calif.
THE FEASIBILITY OF A MULTIPROCESSOR ARCHITECTURE FOR REAL-TIME CONTOUR SURFACE DISPLAY GENERATION
M. J. Zyda Dec. 1984 24 p
(RR0-0001)
(AD-A149427; AD-E500690; NPS52-84-025) Avail: NTIS HC A02/MF A01 CSCL 09/2

We present in this study the architectural specification and feasibility determination for a real-time contour surface display generator. We begin by selecting for architectural implementation a recently reported, highly decomposable algorithm for contour surface display generation. We establish a piece of the total algorithm as the algorithm component. The algorithm component is that part of the algorithm that can be executed in parallel, independently from the computations performed on any other algorithm subpart. We propose an architecture for the algorithm component, and model that architecture in order to determine the real-time capability of the algorithm. We then model the larger system of multiple algorithm component processors. This modeling effort is performed with respect to a particular application requiring real-time contour surface display generation. A VLSI feasibility computation is then performed on the proposed architecture. The study ends with a look at the impact of real-time contour surface display generation on the design of the graphics display system. GRA

N85-19698# University of Southern California, Marina del Rey. Information Sciences Inst.
RESEARCH ON KNOWLEDGE DELIVERY Final Report, 15 Aug. 1979 - 14 Aug. 1984
W. C. Mann Dec. 1984 14 p
(Contract F49620-79-C-0181)
(AD-A149565; ISI/SR-84-148) Avail: NTIS HC A02/MF A01 CSCL 09/2

The general practical goal of this work is to enable computers to express information in appropriate, easily read, multiparagraph English text. This report describes the progress of the Knowledge Delivery project toward that goal, focusing on three tactical areas: computer grammars of English for text generation, control structures for text generation, and the description and construction of discourse structures. The project's accomplishments in these three areas are expressed in the Nigel grammar, the Penman system, and the Rhetorical Structure theory, respectively. Author (GRA)

N85-19699# Tennessee Valley Authority, Chattanooga. Electrical Systems Group.
MICROPROCESSOR-BASED MONITORING AND CONTROL PROJECT, PHASE 1
Wayne Hilson Jan. 1984 75 p refs
(DE84-901974; TVA/OP/EDT-84/30) Avail: NTIS HC A04/MF A01

This project is part of an ongoing effort in the Electrical Systems Group of TVA's division of Energy Demonstrations and Technology (ED and T) to develop microprocessor-based systems for special-purpose applications in the monitoring of power systems parameters and the control and protection of power system apparatus to improve power operations. The system presently configured receives its voltage and current signals from conventional potential and current transformers. However, under a separate project, ED and T will test and evaluate electro-optic and magneto-optic voltage and current sensors for eventual use with microprocessor-based systems. The initial activities performed in configuring the microprocessor-based system to monitor and compute power system parameters at the Concord 161-kV Substation are discussed in detail. DOE

N85-19700# Indiana Univ., Bloomington. Center for Transit Research and Management Development.
MICROCOMPUTERS IN TRANSIT: A HARDWARE HANDBOOK Final Report
John Robbins, Eve Wyatt, and George Smerk Jul. 1984 68 p refs
(Grant DOT-UMTA-IN-11-0009)
(PB85-113660; UMTA-IN-11-0009-84-1) Avail: NTIS HC A04/MF A01 CSCL 09B

The hardware components of a microcomputer system are introduced within the context of the concerns of transit operations. The elements of a microcomputer system and the preparations which should be completed before considering specific hardware items are overviewed. The range of available equipment and characteristics to look for in selecting equipment is discussed. A discussion is also made of each of the major components of a microcomputer system, which includes the computer itself, the memory, input and output devices, and optional enhancements. GRA

N85-19207# Joint Publications Research Service, Arlington, Va.
RESEARCHERS, PROJECTS AT FRENCH INTELLIGENT MACHINE CENTER
Xavier Dalloz *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 43-46 Transl. into ENGLISH from Minis et Micros (Paris), 24 Sep. 1984 p 39-40 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

N85-19208# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM DEVELOPS 2D, 3D COMPUTER VISION SYSTEM
Rosalie Hurtado *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 47-52 Transl. into ENGLISH from Minis et Micros (Paris), 24 Sep. 1984 p 41-43 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-19701*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ALGORITHMS FOR THE EULER AND NAVIER-STOKES EQUATIONS FOR SUPERCOMPUTERS Final Report
Eli Turkel Feb. 1985 29 p refs
(Contracts NAS1-16394; NAS1017070)
(NASA-CR-172543; NAS 1.26:172543; ICASE-85-11) Avail: NTIS HC A03/MF A01 CSCL 09B

The steady state Euler and Navier-Stokes equations are considered for both compressible and incompressible flow. Methods are found for accelerating the convergence to a steady state. This acceleration is based on preconditioning the system so that it is no longer time consistent. In order that the acceleration technique be scheme-independent, this preconditioning is done at the differential equation level. Applications are presented for very slow flows and also for the incompressible equations. Author

N85-19702*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUBOPT: A CAD PROGRAM FOR SUBOPTIMAL LINEAR REGULATORS Final Report
Peter J. Fleming Feb. 1985 18 p refs
(Contract NAS1-17070)
(NASA-CR-172536; NAS 1.26:172536; ICASE-85-6) Avail: NTIS HC A02/MF A01 CSCL 09B

An interactive software package which provides design solutions for both standard linear quadratic regulator (LQR) and suboptimal linear regulator problems is described. Intended for time-invariant continuous systems, the package is easily modified to include sampled-data systems. LQR designs are obtained by established techniques while the large class of suboptimal problems containing controller and/or performance index options is solved using a robust gradient minimization technique. Numerical examples demonstrate features of the package and recent developments are described. Author

N85-19703# Softech, Inc., Waltham, Mass.
Ada (TRADEMARK) PRIMER
Nov. 1984 339 p Supersedes report dated Jan. 1984, AD-A140660
(Contract DAAB07-83-C-K514)
(AD-A148855) Avail: NTIS HC A15/MF A01 CSCL 09/2

Ada is a high order language (HOL) developed by the Department of Defense (DOD) to be used in programming embedded systems. It is anticipated that use of Ada will significantly reduce the costs associated with defense software by providing more maintainable code. One of the goals of this workbook is to illustrate how to use the features of the Ada language to help produce more maintainable code. Ada Primer is the first of a series of three workbooks. It leads the novice through the fundamentals of Ada by addressing the so-called PASCAL subset of Ada. This workbook may be used in conjunction with module L202, Basic Ada Programming. A student, having completed L202 in conjunction with this workbook, shall be able to use an Ada package and code Ada subprograms using the Pascal subset of Ada. With the exception of Section 1 of this workbook, each workbook is organized as a series of Ada exercises to be solved by the reader. This workbook is intended for those individuals who have either a Bachelor's Degree in one of the sciences (with Computer Science courses included), an Associate in Arts Degree in Computer Science, or a strong background in high order languages such as Pascal, FORTRAN, JOVIAL, or CMS-2. GRA

N85-19704# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
METHODS OF COMPUTER-AIDED ANALYSIS OF NON-GAUSSIAN NOISE AND APPLICATION TO ROBUST ADAPTIVE DETECTION, PART 2 Final Report, 15 Apr. 1981 - 30 Sep. 1984
I. Kirsteins and D. W. Tufts Oct. 1984 59 p 2 Vol.
(Contract N00014-81-K-0144)
(AD-A148879) Avail: NTIS HC A04/MF A01 CSCL 09/2

We present a methodology for the modeling of certain non-stationary and non-Gaussian random time series data with application to weak signal detection. Some components of the noise, which give it its non-Gaussian characteristics, can be individually modeled, synthesized and subtracted to provide a Gaussian residual. Further, it is shown that this process can also be carried out when signals are present. The proposed methodology is applied to some Arctic Acoustic data using a combination of adaptive differential quantization and adaptive signal estimation algorithms based on singular-value-decomposition of a data matrix which we have developed. The combination of adaptive differential quantization with low-rank approximations to data matrices or estimated covariance matrices is believed to be a new and effective method for multivariable, robust, adaptive detection. GRA

N85-19705# Pittsburgh Univ., Pa. Inst. for Computational Mathematics and Applications.
A PROGRAM DESIGN FOR AN ADAPTIVE, NON-LINEAR FINITE ELEMENT SOLVER
F. R. Sledge and W. C. Rheinboldt 1984 19 p
(Contract N00014-80-C-0455)
(AD-A148880; ICMA-84-68) Avail: NTIS HC A02/MF A01 CSCL 09/2

An experimental software system for the solution of a class of non-linear, stationary boundary-value problems is currently under development at the University of Pittsburgh. The program NFEARS (Non-linear Finite-Element Adaptive Research Solver) is a further development of the program FEARS which utilized bilinear elements to solve linear elliptic problems. NFEARS retains the functionality of the earlier program, but incorporates a continuation procedure to solve non-linear problems, using biquadratic Hermitian elements. The NFEARS design properties include the following: (1) the system constitutes an applications-independent finite-element solver for a certain class of two-dimensional, non-linear, stationary, boundary-value problems defined by a weak mathematical formulation; (2) adaptive approaches are employed extensively and a posteriori error indicators are used to control the adaptive processes and to provide a solution with near optimal error within a prescribed cost range; (3) in the system design, advantage was taken of the inherent parallelism and modularity of the finite element method. In particular, a two-level data structure has been employed to take maximum advantage of the parallelism in the continuation process; and (4) the system is highly modular in structure, reflecting not only the natural separation by distinct function, but also the isolation of those processes, particularly error analysis, which are anticipated to be of the greatest experimental interest. In this way, the migration of NFEARS from convenient research vehicle to efficient production tool will be gradual and controlled. Extensive provisions for evaluating the performance are incorporated. GRA

N85-19706# Army Construction Engineering Research Lab., Champaign, Ill.
GRAPHICS TRANSLATORS FOR COMPUTER-AIDED DRAFTING AND DESIGN: INTERFACE ALTERNATIVES FOR THE A/E COMMUNITY Final Report
L. M. Golish and L. W. Emberley Nov. 1984 43 p
(DA Proj. 4A1-62731-AT-41)
(AD-A148892; AD-E850737; CERL-TR-P-85/03) Avail: NTIS HC A03/MF A01 CSCL 09/2

Increased development and competition in the computer-aided graphics industry has produced many advanced systems for architecture and engineering (A/E). However, this growth in technology has come without standardization, making it difficult or impossible to transfer data between dissimilar systems. Graphics translators are studied for potential in transferring A/E information from one system to another. Two types of translators are considered--direct and neutral--with neutral formats showing more promise industry-wide. Progress by professional organizations in standardizing a neutral graphics translator is discussed. GRA

N85-19707# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics and Logistics Dept.
COMPUTER CENTER CDC LIBRARIES Final Report
D. V. Sommer and S. E. Good Jun. 1984 124 p
(AD-A149005; DTNSRDC/CMLD-84-11) Avail: NTIS HC A06/MF A01 CSCL 09/2

The Computer Center CDC Libraries (CLIB) manual is a cross reference volume for many subprograms, programs, utilities and procedures available on the CDC cyber 170 computers at DTNSRDC. The CLIB lists the routines by functional category and alphabetically, by library, with descriptive titles. GRA

N85-19708# Yale Univ., New Haven, Conn. Dept. of Computer Science.
MANAGING PERMANENT OBJECTS
N. Mishkin Nov. 1984 90 p
(Contract N00014-82-K-1054; Grant NSF MCS-81-16678)
(AD-A149007; YALEU/DCS/RR-338) Avail: NTIS HC A05/MF A01 CSCL 09/2

This work describes a programming system that facilitates the management of data objects that live across multiple invocations of programs that read and modify those objects; we call such data objects permanent objects. Typically, programmers needing to save data objects permanently do so either: (1) by writing an ad hoc set of procedures that convert their data from some internal representation to some external representation (and back); or (2) by interfacing their programs with an existing database system. We discuss the problems encountered by a programmer adopting either of these strategies, and we describe our system whose design is an attempt to strike a balance between the flexibility of the ad hoc approach and the rigidity of the approach that employs a database. A key goal of our work is the design and implementation of a system that makes the manipulation of permanent objects nearly as easy and flexible as the manipulation of transient objects i.e., the memory resident data structures that programmers are accustomed to dealing with. We wish to hide the details associated with the fact that permanent objects must have their permanent home in a disk file system. GRA

N85-19709# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
META-LEVEL CONTROL THROUGH FAULT DETECTION AND DIAGNOSIS
Eva Hudlicka and Victor R. Lesser 30 May 1984 23 p
(Contract N00014-79-C-0439; Grant NSF MCS-83-06327; NR Proj. 049-441)
(AD-A149064) Avail: NTIS HC A02/MF A01 CSCL 09/2

Control strategies in most complex problem-solving systems, though highly parameterized, are not adaptive to the characteristics of the particular task being solved. If the characteristics of the task are a typical, a fixed control strategy may cause incorrect or inefficient processing. This document presents an approach for adapting the control strategy by introducing a meta-level control component into the problem-solving architecture. This meta-level control component is based on the paradigm of Fault Detection/Diagnosis. The authors presentation will concentrate on modeling the problem-solving system and on the inference techniques necessary to use this model for diagnosis. They feel that meta-level control based on the Fault Detection/Diagnosis paradigm represents a new approach to introducing more sophisticated control into a problem-solving system. Author (GRA)

N85-19710# Mitre Corp., McLean, Va.
Ada IN MISSION CRITICAL SYSTEM ACQUISITION: A GUIDEBOOK
S. N. Mohanty Sep. 1984 56 p
(Contract F19628-84-C-0001)
(AD-A149271; MTR-84W00189) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report discusses several issues that influence the successful acquisition of major mission-critical systems. These issues range from the role of software in the system acquisition process, and the state of software engineering practice in industry, to Ada compiler validation, Ada run-time environment, Ada programming environment, Ada reuse, and Ada productivity. A project manager must deal with each of these issues during the course of his procurement and must devise plans to identify them and eliminate them in order to make his program a successful one. GRA

N85-19711# Advanced Information and Decision Systems, Mountain View, Calif.
DESIGN OF A PICTORIAL PROGRAM REFERENCE LANGUAGE Final Report, 1 Jun. 1981 - 30 May 1984
E. A. Domeshek, J. S. Dean, S. G. Rosenbaum, and B. P. McCune Aug. 1984 71 p
(Contract F49620-81-C-0067)
(AD-A149323; AI/DS-TM-1014-4; AFOSR-84-1159TR) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report covers the work done during the third year of the Program Reference Language (PRL) project. During this year we focused on the problem of developing an adequate means to express the types of queries we had earlier identified as within the province of the PRL. Thus, we studied both the structure of the actual query language and the design of the user interface. The query language on which we concentrated was a pictorial interface designated the PRL Pictorial Language (PRL/PL). The essential idea is that the users build templates to sketch out what an item that satisfied the query would look like. For programs, this means specifying an arrangement of standard program fragments that characterize the desired part of the program. This document will discuss the design and the use of this pictorial language. GRA

N85-19712# Denver Research Inst., Colo.
INTERACTIVE GRAPHICS SIMULATOR: DESIGN, DEVELOPMENT AND EFFECTIVENESS/COST EVALUATION Final Report, Apr. 1981 - Sep. 1984
W. J. Pieper, J. J. Richardson, K. R. Harmon, and R. A. Keller Dec. 1984 138 p
(Contract F33615-81-C-0006)
(AD-A149417; AFHRL-TR-84-38) Avail: NTIS HC A07/MF A01 CSCL 05/9

This report covers the design, development, implementation, and evaluation of a new task and videodisc-based simulator, the Interactive Graphics Simulator (IGS). The test vehicle was the 6883 Converter Flight Control Test Station and its associated training course at Lowry AFB, Colorado. The computer-based simulator provided for task emulation of job planning tasks, as well as for equipment manipulation tasks. The simulation system provided a means of on-line task analysis, of simulation development from the task data base, of presenting simulations to students, and of adapting simulation presentation to the level of student achievement. Simulation lessonware covered both procedural equipment operation and troubleshooting activities. A comparative study was performed with 22 students using the actual equipment

trainer (AET) during training and 21 students using the IGS. Evaluation of the outcomes included training effectiveness analyses based on a conventional ATC block test, on a hands-on equipment operating procedures test, on a paper-and-pencil troubleshooting test, and on a predictive job performance test. The IGS-trained students performed significantly better on the troubleshooting test; however, no other significant performance differences were found. A comparison of the IGS and AET costs showed the IGS to be substantially less expensive in terms of acquisition and operating costs. Student attitudes toward the IGS were favorable, and the system operated extremely well in a standard ATC classroom environment. GRA

N85-19713# Institute for Defense Analyses, Alexandria, Va.
Ada (TRADEMARK) JOINT PROGRAM OFFICE OBJECTIVES AND PROGRESS THROUGH 1983 Final Report
J. F. Kramer, Jr. and C. W. McDonald Sep. 1984 72 p
(Contract MDA903-84-C-0031)
(AD-A149436; AD-E500690; IDA-M-22; IDA/HQ-84-29112) Avail: NTIS HC A04/MF A01 CSCL 09/2

In 1975, the Department of Defense (DOD) began the process of standardizing the high order languages used to write software for embedded computers. The first step was to form a High Order Language (HOL) Working Group to identify DOD's requirements for computer programming languages, evaluate the existing languages, and recommend the implementation and control of a minimal set. Although an interim set of languages was established, none were considered to be a long term solution to the DOD's programming needs. Therefore, an international request for proposals was issued for a new common language. The final requirements document, STEELMAN, served as the standard for the selection of the new DOD HOL. In 1979, this new language, developed by Cii-Honeywell Bull, was named Ada in honor of Augusta Ada Byron, the countess of Lovelace. On 12 December 1980, the Under Secretary of Defense for Research and Engineering established the Ada Joint Program Office to manage the DOD's effort to implement, introduce and provide life-cycle support for Ada. This paper outlines past, present and future objectives of the Ada Joint Program Office. GRA

N85-19714# Army Electronic Proving Ground, Fort Huachuca, Ariz.
METHODOLOGY INVESTIGATION SOFTWARE TESTING OF MULTIPROCESSOR SYSTEMS Final Report
R. G. Jacques Oct. 1984 18 p
(DA Proj. IT6-65702-D-625)
(AD-A149446) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Software Testing of Multiprocessor Systems methodology investigation established methods for evaluation of software for systems containing multiple interactive processors. A number of multiprocessor monitors/debuggers were examined for function and design approach. The investigation resulted in the development of a hybrid monitor concept; the integration of both hardware and software monitor capabilities into a central monitor system. GRA

N85-19715# Naval Ship Research and Development Center, Bethesda, Md.
SOLIDGEN: A SOLID FINITE ELEMENT DATA GENERATOR. USER'S MANUAL Final Report
R. J. Kazden and J. M. McKee Dec. 1984 101 p
(Proj. F43-411)
(AD-A149490; DTNSRDC-84/081) Avail: NTIS HC A06/MF A01 CSCL 09/2

SOLIDGEN is a computer program for generating finite element models of three-dimensional solid objects from descriptions of their external surfaces. SOLIDGEN's ease of use, power, and generality stem from the use of GPRIME surfaces to describe the surfaces of the object being modeled. GPRIME is an interactive software package which has facilities for defining a wide variety of curves and surfaces through its own geometric language. The GPRIME surface descriptions are stored in data base which is accessible to SOLIDGEN. SOLIDGEN uses those GPRIME surfaces by simply referring to their symbolic names. The most important step in modeling a solid object is to visualize the subdivision of the object into volumes called zones. The subdivision of each zone into finite elements is controlled by specifying sets of reference surfaces. Isoparametric shape functions are used to obtain the coordinates of the generated grid points. The elements generated are always brick elements. Several element formats are available, including a general connection element. Users can easily create brick elements with formats suited to their own needs from the information provided in the general connection element. SOLIDGEN is currently operational on CDC-6000 Series computers. This document describes the capabilities of SOLIDGEN, tells how to use the program and describes work in progress. GRA

N85-19716# Oak Ridge National Lab., Tenn.
MANAGEMENT CHALLENGES ENCOUNTERED IN CAD IMPLEMENTATION
Donald D. Cannon and Keith G. Kahl 1984 12 p Presented at the Am. Soc. of Eng. Management Natl. Meeting, Dallas, 20 Aug. 1984
(Contract DE-AC05-84OT-21400)
(DE85-002072; K/D-5590; CONF-8408125-1) Avail: NTIS HC A02/MF A01

Implementation of a Computer-Aided Design System in a design engineering organization involves a number of challenges. Challenges that range from selling the acquisition to both management and the design staff to solving communication, problems between unlike hardware and software systems are described. Many of the challenges are managerial in nature and even the technical challenges require management skills if they are to be effectively mastered. The challenges could become a deterrent to progress if one elects to wait until completely satisfactory approaches are developed which provide all the answers in advance. Reasonable progress requires some risk taking and use of multiple approaches and contingency plans. The dynamic nature of CAD technology is discussed. Prudence in system selection, tempered early expectations, and considerable patience are required to survive. DOE

N85-19717# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
FOUR PHASE SYSTEMS, INCORPORATED, FOUR PHASE SERIES 5000, COBOL 1974 VERSION BE08.8 Validation Summary Report
2 Aug. 1984 56 p
(PB85-108017; OIT/FSTC-84/295) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Four Phase Systems, Inc., COBOL '74 Version BE08.8 running under the MFE BN08 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module with X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-19718# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
FOUR PHASE SYSTEMS, INCORPORATED, MINI-FRAME SERIES 6300, COBOL SERIES 6000 Validation Summary Report
7 Aug. 1984 59 p
(PB85-108025; OIT/FSTC-84/296) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Four Phase Systems, Inc., COBOL Series 6300 running under the UNIX-DERIVED System V provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the

discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-19719# National Computing Centre Ltd., Manchester (England). COBOL Validation Service.
MICRO FOCUS DEC RAINBOW 100 + COMPACT LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p Sponsored by Federal Compiler Testing Center
(PB85-108975; OIT/FSTC-84/510) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, Compact Level 2 COBOL; V2.5 running under the Microsoft MS-DOS, version 2.05, from DEC provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the languages, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-19720# National Computing Centre Ltd., Manchester (England).
MICRO FOCUS DEC RAINBOW 100 + HIGH PERFORMANCE LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p
(PB85-108983; OIT/FSTC-84/505) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, High Performance Level 2 COBOL; V2.5 running under the Microsoft MS-DOS, Version 2.05, from DEC provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The compiler is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-19721# Federal Compiler Testing Center, Falls Church, Va.
DTSS, INCORPORATED, DPS 8/44, DTSS COBOL RELEASE 12 Validation Summary Report
14 Aug. 1984 46 p refs
(PB85-108058; OIT/FSTC-84/315) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the DTSS Incorporated, DTSS COBOL Release 12 running under the DTSS provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-19722# Federal Compiler Testing Center, Falls Church, Va.
SPERRY UNIVAC SYSTEM 80, MODEL 6, OS/3 BASIC, VERSION 10.01 Validation Summary Report
4 Sep. 1984 11 p
(PB85-108066; OIT/FSTC-84/320) Avail: NTIS HC A02/MF A01 CSCL 09B

A Validation Summary Report for the Sperry Univac, OS/3 BASIC Version 10.01 running under the OS/3 Level 8.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. Several sections show all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies together with the tests which failed. GRA

N85-19723# National Bureau of Standards, Gaithersburg, Md. Center for Applied Mathematics.
SELECTED NBSNET SOFTWARE Interim Report
M. Strawbridge, S. Schooley, R. Crosson, and J. Sokol, Jr. Sep. 1984 111 p refs
(PB85-109148; NBSIR-84/2902) Avail: NTIS HC A06/MF A01 CSCL 09B

NBSNET is a local area communications network at the National Bureau of Standards. Ethernet-like in its design, it has operated successfully since 1979, supporting terminal-computer and computer-computer communications. Devices physically connect to NBSNET through RS-232-C interfaces; each being customized to the device being served. Customization primarily involves modifying the control program, called a personality, for each interface. Each personality is divided into modules which implement, among other things, the network's internal protocol and the extent device communications protocol. Three external device protocols are used. A listing of some typical personality modules is supplied. GRA

N85-19724# Federal Compiler Testing Center, Falls Church, Va.
FORTRAN 66 ANALYSER: USER'S MANUAL
Nov. 1984 58 p refs
(PB85-111748; OIT/FSTC-84/012; GSA/DF-85/001A) Avail: NTIS HC A04/MF A01 CSCL 09B

The FORTRAN 66 Analyzer software tool accepts as input, a working FORTRAN 66 source program. The Analyzer evaluates the structure of a FORTRAN program, statistically, based on the source code. The Analyzer produces an instrumented version of the source program. The Instrumented program contains code which in effect measures the source program's performance during it's execution. The Instrumented program produces statistics on segments execution frequencies. These statistics identify the total number segments (paths) within a program; the number of times each segment was executed; and the percentage of segments executed. GRA

N85-19725# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering and Applied Mechanics.
RELTIM: A LIBRARY OF ROUTINES USED IN REAL TIME MACHINE CONTROL APPLICATIONS
F. Rasmussen, L. K. Lauderbaugh, and A. G. Ulsoy May 1984 51 p
(Grant NSF MEA-81-12629)
(PB85-116507; UM/MEAM-84/24; NSF/MEA-84009) Avail: NTIS HC A04/MF A01 CSCL 09B

A library of FORTRAN callable routines, RELTIM, LIB, that were developed for use in real time machine control applications are described. The four general categories of routines are: (1) digital to analog and analog to digital conversion (DAC/ADC) routines, which allow the user to send a voltage out through a given channel of the DAC or read a voltage in from a given channel of the ADC; (2) parallel input/output routines, which allow the user to write out, or read in, a 16-bit binary number to, or from, one of four channels; (3) programmable real time clock routines, which allow the user to start the clock, keep track of, and reset the time in hours, minutes, seconds, and milliseconds; and (4) peek and poke routines, which allow the user to write a number to, or read a number from, a given address in memory. GRA

N85-19726# National Bureau of Standards, Gaithersburg, Md. Center for Applied Mathematics.
DIAMONDS AND DIAMOND SORTING
E. Bromberg and F. Sullivan Sep. 1984 24 p
(PB85-128502; NBSIR-84/2936) Avail: NTIS HC A02/MF A01 CSCL 09B

The diamond sort algorithm is described and analyzed. The algorithm is designed for parallel operations, which makes it well suited to vector-computer architecture. The instruction sequences are fixed, without any branches. The algorithm therefore has a fixed complexity determined solely by the number of elements to be sorted, rather than by any pattern of distribution of element values. The diamond sort is of special interest not only because of the unusual arrangement of its steps, but also because it introduces the concept of a diamond as a set with a specific kind of partial ordering that is closely linked to the having principle, which is used in the sort procedure. GRA

N85-19209# Joint Publications Research Service, Arlington, Va.
SIEMENS' CAD SYSTEM DESIGNS VLSI CIRCUITS
Berthold Koch and Martin Nett *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 52-55 Repr. from Data Rept. (Munich), Sep. 1984 p 18; 20-21 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

N85-19218# Joint Publications Research Service, Arlington, Va.
CONTROL SYSTEM OF COMPLEX CNC MACHINING CELL
T. M. Yavid *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 34-39 Transl. into ENGLISH from Mekhan. i Avtomatiz. Proizv. (Moscow), no. 6, Jun. 1984 p 27-29 (For primary document see N85-19211 10-37)
Avail: NTIS HC A04

N85-19219# Joint Publications Research Service, Arlington, Va.
PRODUCTIVITY GAINS THROUGH CAD OF CNC PROGRAMS
V. A. Bakhvalov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-85-003) 12 Feb. 1985 p 40-46 Transl. into ENGLISH from Mekhan. i Avtomatiz. Proizv. (Moscow), no. 5, May 1984 p 10-12 (For primary document see N85-19211 10-31)
Avail: NTIS HC A04

N85-19236*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONCEPTS AND TOOLS FOR THE SOFTWARE LIFE CYCLE
R. C. Tausworthe *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 103-120 refs (For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

No abstracts in this category.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N85-19727# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
DUAL ADAPTIVE CONTROL BASED UPON SENSITIVITY FUNCTIONS
J. A. Molusis, P. Mookerjee, and Y. Bar-Shalom 1984 7 p
(Grants NAG2-213; AF-AFOSR-0098-80)
(NASA-CR-169331; NAS 1.26:169331; AD-A146941; AFOSR-84-0888TR) Avail: NTIS HC A02/MF A01 CSCL 09/3

A new adaptive dual control solution is presented for the control of a class of multivariable input-output systems. Both rapidly varying random parameters and constant but unknown parameters are included. The new controller modifies the cautious control design by numerator and denominator correction terms. This controller is shown to depend upon sensitivity functions of the expected future cost. A scalar example is presented to provide insight into the properties of the new dual controller. Monte-Carlo simulations are performed which show improvement over the cautious controller and the Linear Feedback Dual Controller. Author (GRA)

N85-19728# Texas Univ., Austin. Dept. of Electrical and Computer Engineering.
RESEARCH IN ADAPTIVE AND DECENTRALIZED CONTROL Interim Report, 15 Mar. - 14 Sep. 1984
S. I. Marcus 1 Oct. 1984 4 p
(Grant AF-AFOSR-0089-84)
(AD-A148964; AFOSR-84-1148TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Progress has been made in a number of aspects of the proposed research areas. First, the investigators have continued to work on problems of adaptive stochastic control of queues with complete observations. The stochastic adaptive control problems solved to date have all, with the exception of those for linear systems, involved the assumption of complete (noiseless) state observations. Details are presented in this report. GRA

N85-19729# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
QUALITATIVE PROCESS THEORY Ph.D. Thesis
K. D. Forbus Jul. 1984 183 p
(Contract N00014-80-C-0505)
(AD-A148987; AD-E301513; AI-TR-789) Avail: NTIS HC A09/MF A01 CSCL 09/4

Objects move, collide, flow, bend, heat up, cool down, stretch, compress, and boil. These and other things that cause changes in objects over time are intuitively characterized as processes. To understand common sense physical reasoning and make programs that interact with the physical world as well as people do we must understand qualitative reasoning about processes, when they will occur, their effects, and when they will stop. Qualitative Process theory defines a simple notion of physical process that appears useful as a language in which to write dynamical theories. Reasoning about processes also motivates a new qualitative representation for quantity in terms of inequalities, called the quantity space. This report describes the basic components of Qualitative Process theory, several different kinds of reasoning that can be performed with them, and discusses its impact on other issues in common sense reasoning about the physical world, such as casual reasoning and measurement interpretation. Several extended examples illustrate the utility of the theory, including figuring out that a boiler can blow up, that an oscillator with friction will eventually stop, and how to say that you can pull with a string, but not push with it. This report also describes GIZMO, an implemented computer program which uses Qualitative Process theory to make predictions and interpret simple measurements. The representations and algorithms used in GIZMO are described in detail, and illustrated using several examples. GRA

N85-19730# Wisconsin Univ., Madison. Mathematics Research Center.
A NOTE ON THE DISTURBANCE DECOUPLING PROBLEM FOR RETARDED SYSTEMS
Ruth F. Curtain (Rijksuniversiteit Groningen) and Dietmar Salamon Oct. 1984 12 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A149045; MRC-TSR-2762) Avail: NTIS HC A02/MF A01 CSCL 09/4

The disturbance decoupling problem for linear control systems is to design a feedback control law in such a way that the

disturbances do not influence these outputs which are to be regulated. In this note we present a very simple solution to this problem for a rather general class of retarded functional differential equations with delays in the state variables. GRA

N85-19731# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.
MONITORING THE EXECUTION OF PLANS IN SIPE (SYSTEM FOR INTERACTIVE PLANNING AND EXECUTION) MONITORING Final Technical Report, 1 Sep. 1983 - 31 Aug. 1984
D. E. Wilkins 6 Sep. 1984 42 p
(Contract F49620-79-C-0188)
(AD-A149138; AFOSR-84-1161TR) Avail: NTIS HC A03/MF A01 CSCL 15/7

In real-world domains (a mobile robot is used as a motivating example), things do not always proceed as planned. Therefore it is important to develop better execution-monitoring techniques and replanning capabilities. This paper describes the execution-monitoring and replanning capabilities of the SIPE planning system. (SIPE assumes that new information to the execution monitor is in the form of predicates, thus avoiding the difficult problem of how to generate these predicates from information provided by sensors.) The execution-monitoring module takes advantage of the rich structure of SIPE plans (including a description of the plan rationale), and is intimately connected with the planner, which can be called as a subroutine. The major advantages of embedding the replanner within the planning system itself are: (1) The replanning module can take advantage of the efficient frame reasoning mechanisms in SIPE to quickly discover problems and potential fixes; (2) The deductive capabilities of SIPE are used to provide a reasonable solution to the truth maintenance problem; and (3) The planner can be called as a subroutine to solve problems after the replanning module has inserted new goals in the plan. Another important contribution is the development of a general set of replanning actions that will form the basis for a language capable of specifying error-recovery operators, and a general replanning capability that has been implemented using these actions. GRA

N85-19732# Office of Naval Research, London (England).
FRENCH PLANS FOR FIFTH GENERATION COMPUTER SYSTEMS
J. F. Blackburn 7 Dec. 1984 10 p
(AD-A149435; AD-E500690; ONRL-R-12-84) Avail: NTIS HC A02/MF A01 CSCL 09/2

Since the October 1981 announcement of Japan's Fifth Generation Project, the French scientific and industrial communities have shown an increased interest in artificial intelligence languages, expert systems, man-computer interaction, novel computer structures, and knowledge-based computer systems. This report describes the French effort and includes a survey of the various French initiatives in hardware and software technologies aimed toward fifth generation computer systems and applications. These separate projects are the National Projects, the Joint Research Projects, the Centre National de Recherche Scientifique Cooperative Research Groups, and the Thematic Research Program. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-19733*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MODELING THE INTERNAL COMBUSTION ENGINE
Frank J. Zeleznik and Bonnie J. McBride Mar. 1985 309 p refs
(NASA-RP-1094; E-996; NAS 1.61:1094) Avail: NTIS HC A14/MF A01 CSCL 12A

A flexible and computationally economical model of the internal combustion engine was developed for use on large digital computer systems. It is based on a system of ordinary differential equations for cylinder-averaged properties. The computer program is capable of multicycle calculations, with some parameters varying from cycle to cycle, and has restart capabilities. It can accommodate a broad spectrum of reactants, permits changes in physical properties, and offers a wide selection of alternative modeling functions without any reprogramming. It readily adapts to the amount of information available in a particular case because the model is in fact a hierarchy of five models. The models range from a simple model requiring only thermodynamic properties to a complex model demanding full combustion kinetics, transport properties, and poppet valve flow characteristics. Among its many features the model includes heat transfer, valve timing, supercharging, motoring, finite burning rates, cycle-to-cycle variations in air-fuel ratio, humid air, residual and recirculated exhaust gas, and full combustion kinetics. Author

N85-19734*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A GALERKIN METHOD FOR THE ESTIMATION OF PARAMETERS IN HYBRID SYSTEMS GOVERNING THE VIBRATION OF FLEXIBLE BEAMS WITH TIP BODIES Final Report
H. Thomas Banks and I. Gary Rosen Feb. 1985 48 p refs
(Contracts NAS1-17070; DAAG29-83-K-0029; Grants NSF MCS-82-05355; AF-AFOSR-TR-0390-84)
(NASA-CR-172537; NAS 1.26:172537; ICASE-85-7; AFOSR-81-0198TR) Avail: NTIS HC A03/MF A01 CSCL 12A

An approximation scheme is developed for the identification of hybrid systems describing the transverse vibrations of flexible beams with attached tip bodies. In particular, problems involving the estimation of functional parameters are considered. The identification problem is formulated as a least squares fit to data subject to the coupled system of partial and ordinary differential equations describing the transverse displacement of the beam and the motion of the tip bodies respectively. A cubic spline-based Galerkin method applied to the state equations in weak form and the discretization of the admissible parameter space yield a sequence of approximating finite dimensional identification problems. It is shown that each of the approximating problems admits a solution and that from the resulting sequence of optimal solutions a convergent subsequence can be extracted, the limit of which is a solution to the original identification problem. The approximating identification problems can be solved using standard techniques and readily available software. R.S.F.

N85-19735# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
COLLISION DETECTION FOR MOVING POLYHEDRA
J. Canny Oct. 1984 19 p
(Contracts N00014-81-K-0494; N00014-80-C-0505; N00014-82-K-0334)
(AD-A148961; AI-M-806) Avail: NTIS HC A02/MF A01 CSCL 20/1

We consider the problem of moving a three dimensional solid object among polyhedral obstacles. The traditional formulation of configuration space for this problem uses three translational parameters and three angles (typically Euler angles), and the constraints between the object and obstacles involve transcendental functions. We show that a quaternion representation of rotation yields constraints which are purely algebraic in a higher-dimensional space. By simple manipulation, the constraints may be projected down into a six dimensional space with no increase in complexity. Using this formulation, we derive an efficient exact intersection test for an object which is translating and rotating among obstacles. GRA

N85-19736# Inform G.m.b.H., Aachen (West Germany).
EFFICIENT ALGORITHM FOR FUZZY LINEAR PROGRAMMING WITH MULTIPLE OBJECTIVES Final Technical Report
R. Hillekamp, G. W. Hintz, B. Werners, H. J. Zimmermann, and P. Zysno 1 Dec. 1984 173 p
(Contract DAJA45-82-C-0009; DA Proj. 1T1-61102-BH-57)
(AD-A149012) Avail: NTIS HC A08/MF A01 CSCL 12/1

On the basis of fuzzy linear programming an interactive decision

support system has been developed which can handle mathematical programming problems with many crisp or fuzzy objective functions and crisp as well as flexible constraints. Empirically tested connectives and membership functions have been included.
Author (GRA)

N85-19737# Stanford Univ., Calif. Dept. of Statistics.
INEQUALITIES FOR THE M/G/INFINITY QUEUE AND RELATED SHOT NOISE PROCESSES
F. Huffer 29 Nov. 1984 47 p
(Contracts N00014-76-C-0475; N00014-83-K-0238)
(AD-A149015; SU-TR-351) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report deals with shot noise processes X(t) which are formed by the superposition of pulses random durations. GRA

N85-19738# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
PREDICTING THE PERFORMANCE OF DISTRIBUTED KNOWLEDGE-BASED SYSTEMS: A MODELING APPROACH
J. Pavlin 1984 6 p
(Grant NSF MCS-80-06327)
(AD-A149021; AD-F300524) Avail: NTIS HC A02/MF A01 CSCL 12/1

A model of a distributed knowledge-based system is presented. The model captures the features specific to those systems, such as alternative paths to the solution utilization of inexact and/or incomplete knowledge and data, dynamic task creation, complex subproblem dependencies, and focusing aspects of problem solving. The model is applied to the analysis of communication policies in a distributed interpretation system. The result of the analysis is the best policy for the given environment and system conditions. Another use of the model as a real-time simulation tool is suggested. GRA

N85-19739# Emory Univ., Atlanta, Ga. Dept. of Mathematics and Computer Science.
NEW METHODS FOR NUMERICAL SOLUTION OF ONE CLASS OF STRONGLY NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS WITH APPLICATIONS IN HYDRODYNAMICS Final Report, 1 Sep. 1983 - 31 Aug. 1984
V. Oliker and P. Waltman Oct. 1984 5 p
(Grant AF-AFOSR-0319-83)
(AD-A149026; AFOSR-84-1147TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This effort studied a proposed numerical method for finding elliptic solutions of the Monge-Ampere equations, in the context of hydrodynamic and antenna design applications. Some computational experiments were performed on representative model problems. A theoretical estimate for the convergence rate of one part of the scheme was obtained. For the problem of reflector antenna design, the solvability of the corresponding linearized problem was demonstrated. A geometric interpretation of the solution was obtained which helps in understanding the problem.
GRA

N85-19740# Stanford Univ., Calif. Lab. for Computational Statistics.
SMOOTHING WITH SPLIT LINEAR FITS
J. A. McDonald and A. B. Owen Jul. 1984 29 p
(Contract N00014-83-K-0472)
(AD-A149032; SU-LCS-TR-7) Avail: NTIS HC A03/MF A01 CSCL 12/1

A family of smoothing algorithms that can produce discontinuous output was introduced. Unlike most commonly used smoothers, that tend to blur discontinuities in the data, this smoother can be used for smoothing with edge detection. Examples are cited of other approaches to (two-dimensional) smoothing with edge detection in image processing, and apply the one-dimensional smoother to sea surface temperature data where the discontinuities arise from changes in ocean currents. GRA

N85-19741# Wisconsin Univ., Madison. Mathematics Research Center.
ASYMPTOTIC REPRESENTATION OF SOLUTIONS OF THE BASIC SEMICONDUCTOR DEVICE EQUATIONS Technical Summary Report
P. A. Markowich and C. Schmeiser Nov. 1984 74 p
(Contract DAAG29-80-C-0041)
(AD-A149040; MRC-TSR-2772) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this paper the basic semiconductor device equations modelling a symmetric one-dimensional voltage-controlled diode are formulated as a singularly perturbed two point boundary value problem. The perturbation parameter is the normed Debye-length of the device. The authors derive the zeroth and first order terms of the matched asymptotic expansion of the solutions, which are the sums of uniformly smooth outer terms (reduced solutions) and the exponentially varying inner terms (layer solutions). The main result of the paper is that, if the perturbation parameter is sufficiently small there exists a solution of the semiconductor device problem which is approximated uniformly by the zeroth order term of the expansion, even for large applied voltages. This result shows the validity of the asymptotic expansions of the solutions of the semiconductor device problem in physically relevant high-injection conditions. GRA

N85-19742# Wisconsin Univ., Madison. Mathematics Research Center.
RECENT DEVELOPMENTS AND OPEN PROBLEMS IN THE MATHEMATICAL THEORY OF VISCOELASTICITY
Michael Renardy Nov. 1984 20 p
(Contract DAAG29-80-C-0041; Grants NSF MCS-82-10950; NSF MCS-82-15064)
(AD-A149043; MRC-TSR-2770) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper presents a nontechnical review of current research efforts in the mathematical theory of viscoelastic materials. Recent results concerning the existence, uniqueness and regularity of solutions for initial value problems as well as for steady flow problems are discussed and a number of open problems are pointed out. GRA

N85-19743# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.
VECTORIZATION AND IMPLEMENTATION OF AN EFFICIENT MULTIGRID ALGORITHM FOR THE SOLUTION OF ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS Interim Report
C. R. DeVore 31 Dec. 1984 36 p
(AD-A149049; NRL-MR-5504) Avail: NTIS HC A03/MF A01 CSCL 12/1

Multilevel adaptive techniques are powerful methods for solving many types of problems in computational physics. In his analysis of multilevel methods for application to elliptic boundary-value problems, Douglas found a particularly efficient algorithm for their solution. This report describes a vectorized, finite-difference implementation of his algorithm suitable for use in large-scale computations. Author (GRA)

N85-19744# Aeronautical Research Labs., Melbourne (Australia). Aerodynamics Div.
A CONFORMAL MAPPING SUITABLE FOR PROBLEMS INVOLVING INTERACTION BETWEEN GIVEN GEOMETRIES AND KNOWN FAR FIELDS
Ton Tran-Cong Sep. 1984 26 p
(AD-A149050; ARL-AERO-TM-367) Avail: NTIS HC A03/MF A01 CSCL 12/1

A conformal transformation formula using Riemann-Stieltjes integrals is derived for use with problems involving the interaction between a given finite-sized geometry and a known far field. The derivative of this transformation is non-singular in the domain considered and tends to one at infinity. A formula is derived for transformation from the unit circle to the exterior of an arbitrarily given continuous curve with bounded variation. A special case of the transformation is very similar to that of Schwarz-Christoffel.

Application to the generation of aerofoils gives some fairly flexible formulae of the finite product type. Author (GRA)

N85-19745# Wisconsin Univ., Madison. Mathematics Research Center.
PERTURBATION OF A MULTIPLE EIGENVALUE IN THE BENARD PROBLEM FOR TWO FLUID LAYERS
Yurilo Renardy and Michael Renardy Dec. 1984 39 p
(Contract DAAG29-80-C-0041)
(AD-A149068; MRC-TSR-2775) Avail: NTIS HC A03/MF A01 CSCL 12/1

In a recent paper, Renardy and Joseph study the Bernard problem for two layers of different fluids lying on top of each other and bounded by walls. Their study shows that, in contrast to the Benard problem for one fluid, the onset of instability can be oscillatory. The number of parameters involved in the problem is large, and there is yet no comprehensive picture of when the instability is oscillatory and when it is not. The study of limiting cases, accessible by perturbation methods, may be helpful in this respect. In this document, an analysis is given for the case when the properties of the two fluids are nearly equal and the fluids are allowed to slip at the boundaries. Author (GRA)

N85-19746# Wisconsin Univ., Madison. Mathematics Research Center.
NEUMANN TYPE BOUNDARY CONDITIONS FOR HAMILTON-JACOBI EQUATIONS
Pierre Louis Lyons (Univ. Paris-Dauphine) Oct. 1984 36 p
(Contract DAAG29-80-C-0041)
(AD-A149069; MRC-TSR-2761) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper, we present a notion of viscosity solutions of Hamilton-Jacobi equations for Neumann type boundary conditions (or more generally oblique derivative). In particular we prove the existence, uniqueness, stability of such solutions and we show that the vanishing viscosity method yields such solutions. Next, we check that value functions of control problems or differential games problems for reflected dynamical processes are solutions in that sense of the associated Bellman or Isaacs equations. Finally, we consider the ergodic problems. GRA

N85-19747# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Sciences.
COMPUTABLE REAL ANALYSIS
Bruce J. MacLennan Dec. 1984 84 p
(AD-A149079; NPS52-84-024) Avail: NTIS HC A05/MF A01 CSCL 12/1

We present a model of the real numbers that is completely finitistic. Every real number is represented by a finite structure-specifically, a finite sequence of symbols from a finite alphabet. All of the arithmetic operations on reals are also finite and can be evaluated on a computer. We allow nothing that cannot be described by a finite algorithm-whether numbers or sequences or functions. This development is carried through the fundamental theorem of calculus. Author (GRA)

N85-19748# Wisconsin Univ., Madison. Mathematics Research Center.
SYMMETRY BREAKING FOR A CLASS OF SEMI-LINEAR ELLIPTIC PROBLEMS
Giovanni Cerami (Univ. di Palermo) Oct. 1984 27 p
(Contract DAAG29-80-C-0041)
(AD-A149093; MRC-TSR-2759) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document considers a nonlinear elliptic problem. Suppose this problem has a family of positive radial solutions parameterized by R, i.e., UR (X). This paper studies the possibility of the existence of nonradial solutions of bifurcating from the radial solutions family. Answering a question posed by Smoller and Wasserman, it is shown this happens if f satisfies suitable assumptions. Therefore, the global structure of the nonradial solution set is investigated. GRA

N85-19749# Wisconsin Univ., Madison. Mathematics Research Center.
HAMILTON-JACOBI EQUATIONS IN INFINITE DIMENSIONS. PART 1. UNIQUENESS OF VISCOSITY SOLUTIONS
Michael G. Crandall and Pierre Louis Lions (Univ. Paris-Dauphine) Nov. 1984 28 p
(Contract DAAG29-80-C-0041)
(AD-A149094; MRC-TSR-2769) Avail: NTIS HC A03/MF A01 CSCL 12/1

The recent introduction of the theory of viscosity solutions of nonlinear first-order partial differential equations which we will call Hamilton-Jacobi equations or HJE's here has stimulated a very strong development of the existence and uniqueness theory of HJE's as well as a revitalization and perfection of the theory concerning the interaction between HJE's and the diverse areas in which they arise. The areas of application include the calculus of variations, control theory and differential games. This paper is the first of a series by the authors concerning the theoretical foundations of a corresponding program in infinite dimensional spaces. The basic question of what the appropriate notion of a viscosity solution should be in an infinite dimensional space is answered in spaces with the Radon-Nikodym property by observing that the finite dimensional characterization may be used essentially unchanged. Technical difficulties which arise in attempting to work with this definition because bounded continuous functions on balls in infinite dimensional spaces need not have maxima are dispatched with the aid of the variational principle which states that maxima do exist upon perturbation by an arbitrarily small linear functional. GRA

N85-19750# Wisconsin Univ., Madison. Mathematics Research Center.
CONTROLLED APPROXIMATION AND A CHARACTERIZATION OF THE LOCAL APPROXIMATION ORDER
C. deBoor and R. Q. Jia Oct. 1984 13 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A149095; MRC-TSR-2763) Avail: NTIS HC A02/MF A01 CSCL 12/1

Document characteristics the local approximation order from a scale (S sub h) of approximating functions on R to the m power is characterized in terms of the linear span (and its Fourier transform) of the finitely many compactly supported functions psi. Author (GRA)

N85-19751# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE QUADRATIC MEAN RADIUS OF A POLYNOMIAL IN Cz Technical Summary Report
I. J. Schoenberg Nov. 1984 1 p
(Contract DAAG29-80-C-0041)
(AD-A149189; MRC-TSR-2773) Avail: NTIS HC A02/MF A01 CSCL 12/1

The main purpose of this note is to state a conjecture which may be regarded as an analogue of Rolle's theorem for arbitrary polynomials P sub n (z) with real or complex coefficient, having the origin z=0 as the centroid of the zeros of P sub n (z). GRA

N85-19752# Naval Research Lab., Washington, D. C.
RELATIVE-ENTROPY MINIMIZATION WITH UNCERTAIN CONSTRAINTS--THEORY AND APPLICATION TO SPECTRUM ANALYSIS
R. W. Johnson and J. E. Shore 31 Dec. 1984 16 p
(AD-A149192; NRL-MR-5478) Avail: NTIS HC A02/MF A01 CSCL 12/1

The relative-entropy principle (principle of minimum cross entropy) is a provably optimal information theoretic method for inferring a probability density from an initial ('prior') estimate together with constraint information that confines the density to a specified convex set. Typically the constraint information takes the form of linear equations that specify the expectation values of given functions. This paper discusses the effect of replacing such linear-equality constraints with quadratic constraints that require linear constraints to hold approximately, to within a specified error

bound. The results are applied to the derivation of a new multisignal spectrum-analysis method that simultaneously estimates a number of power spectra given: (1) an initial estimate of each; (2) imprecise values of the autocorrelation function of their sum; (3) estimates of the error in measurement of the autocorrelation values. One application is to separate estimation of the spectra of a signal and independent additive noise, based on imprecise measurements of the autocorrelations of the signal plus noise. The new method is an extension of multisignal relative-entropy spectrum analysis (with exact auto-correlations). The two methods are compared, and connections with previous related work are indicated. Mathematical properties of the new method are discussed, and an illustrative numerical example is presented. GRA

N85-19753# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
SOME FACETS OF THE TRI-INDEX ASSIGNMENT POLYTOPE
E. Balas and M. J. Saltzman Apr. 1984 39 p
(Contract N00014-82-K-0329; Grant NSF ECS-82-05425)
(AD-A149195; MSR-511) Avail: NTIS HC A03/MF A01 CSCL 12/1

Given three disjoint n-sets and the family of all weighted triplets that contain exactly one element of each set, the 3-index assignment (or 3-dimensional matching) problem asks for a minimum-weight subcollection of triplets that covers exactly (i.e., partitions) the union of the three sets. Unlike the common (2-index) assignment problem, the 3-index problem is NP-complete. In this paper we examine the facial structure of the 3-index assignment polytope (the convex hull of feasible solutions to the problem) with the aid of the intersection graph of the coefficient matrix of the problem's constraint set. In particular, we describe the cliques of the intersection graph as belonging to three distinct classes, and show that cliques in two of three classes induce inequalities that define facets of our polytope. Furthermore, we give an 0 (n to the 4th power) procedure (note that the number of variables is n cubed) for finding a facet-defining clique-inequality violated by a given noninteger solution to the linear programming relaxation of the 3-index assignment problem, or showing that no such inequality exists. GRA

N85-19754# Wisconsin Univ., Madison.
ON THE SPANS OF POLYNOMIALS AND THE SPANS OF A LAGUERRE-POLYA-SCHUR SEQUENCE OF POLYNOMIALS Technical Summary Report
I. J. Schoenberg Oct. 1984 22 p
(Contract DAAG29-80-C-0041)
(AD-A149384; AD-F300533; MRC-TSR-2757) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document proves a conjecture of Meir and Sharma from 1969 determining the least value of the span of a certain derivative P'(x) for > or = 3, if x sub 1 and sub n are kept fixed. Tools used are the Descartes rule of signs and the inequality > or = H between the arithmetic and harmonic mean. The author also applies his results to the infinite sequences of polynomials introduced by G. Polya and I. Schur in a famous paper from 1914. GRA

N85-19755# Wisconsin Univ., Madison. Mathematic Research Center.
SOME QUALITATIVE PROPERTIES OF BIVARIATE EULER-FROBENIUS POLYNOMIALS Technical Summary Report
C. DeBoor, K. Hoellig, and S. Riemenschneider Oct. 1984 20 p
(Contract DAAG29-80-C-0041; Grant NSF DMS-83-51187)
(AD-A149408; MRC-TSR-2756) Avail: NTIS HC A02/MF A01 CSCL 12/1

This is a further report in a series devoted to the study of box splines. Box splines provide a natural generalization of univariate cardinal splines, i.e., splines with a uniform knot sequence. The process of univariate spline interpolation becomes particularly simple in the cardinal case, and this report considers the corresponding bivariate process of interpolation at the integer points in the plane to a given function by a linear combination of integer translates of a box spline. In particular, the report shows that this process is well posed, i.e., any bounded continuous function has exactly one such bounded interpolant If. The argument uses the Fourier transform to identify a certain trigonometric polynomial (in two variables) whose nonvanishing is equivalent to the asserted well-posedness. The minimum value of this polynomial yields a bound on the norm of the resulting interpolation projector 1. GRA

N85-19756# Wisconsin Univ., Madison. Mathematics Research Center.
SINGLE INTEGRAL CONSTITUTIVE EQUATIONS FOR VISCOELASTIC FLUIDS Technical Summary Report
P. Bach and O. Hassager Sep. 1984 80 p
(Contract DAAG29-80-C-0041)
(AD-A149410; MRC-TSR-2755) Avail: NTIS HC A05/MF A01 CSCL 12/1

It is demonstrated how the kernel functions of single integral constitutive equations may be determined from analysis of experiments in time dependent shear-free flows alone. It is assumed that the kernel functions may be factored into a product of a linear viscoelastic function and a finite-strain dependent function. No assumption is needed on the strain-dependent function except that it must be continuous within the attainable invariant space. The experimental data for ever-increasing deformations are not compatible with the assumptions inherent in single integral constitutive equations with factorized kernel functions. GRA

N85-19757# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
INTERNAL VARIABLES IN THE LATTICE FOR CHOLESKY FACTORIZATION. KALMAN FILTERING AND MODEL IDENTIFICATION
L. L. Scharf and C. Demeure Dec. 1984 56 p
(Contracts N00014-82-K-0300; N00014-84-K-0094)
(AD-A149431; AD-E500690) Avail: NTIS HC A04/MF A01 CSCL 12/1

The Levinson recursions provide an efficient algorithm for factoring the inverse of a Toeplitz correlation matrix-R into its upper and lower triangular Cholesky factors. These factors produce a Gram-Schmidt orthogonalization of the underlying time series. The recursions are routinely used to compute reflection coefficients for implementing whitening and predicting filters in lattice form. These are also used to go back and forth between reflection coefficients, order-increasing whiteners, and correlations. One of this document's main purposes is to show how the Levinson recursion for going back and forth between correlations, reflection coefficients, and order-increasing whiteners may be replaced with a dual set of recursions for going back and forth between correlations, reflection coefficients, and order increasing synthesizers. GRA

N85-19758# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ON THE MODIFIED LIKELIHOOD FOR DENSITY ESTIMATION
J. S. Marron and R. L. Taylor 1984 14 p Prepared in cooperation with Georgia Univ.
(Contract N00014-81-K-0373)
(AD-A149437; MS-1560) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that some recent results of Wong (1983) concerning his version of the modified likelihood criterion for smoothing parameter selection in kernel density estimation can be very misleading, because the wrong mode of convergence is established. An example is given to demonstrate that the results are false when a more reasonable mode of convergence is used. Slightly stronger conditions are added and valid proofs for the correct version of these results are indicated. GRA

N85-19759# Royal Signals and Radar Establishment, Malvern (England).
CHECKING MICROCODE ALGEBRAICALLY
J. M. Foster Oct. 1984 18 p
(AD-A149441; RSRE-Memo-3748; DRIC-BR-93876) Avail: NTIS HC A02/MF A01 CSCL 12/1

This Memorandum describes algebraic methods used by a program which processes microcode based on the AMD 2910 in order to find some of its properties. The methods could be applied to other controllers. Examples of the properties which can be found are given, including checking for timing constraints, ensuring that interrupts are polled frequently, checking against expression stack overflow and ensuring the absence of certain sequences of instruction. The method separates into a part which deals only with the control structure, for this program that of the AMD 2910, and a part which deals with the operations performed by the micro-instructions, in this case those of the ICL Perq. It has been used to check many properties of the implementation of Flex on Perq, which involves more than 4000 microinstructions. GRA

N85-19760# Wisconsin Univ., Madison. Mathematics Research Center.
ANALYZING TWO-LEVEL FRACTIONAL FACTORIAL EXPERIMENTS FOR POSSIBLE DISPERSION EFFECTS Technical Summary Report
G. E. P. Box and R. D. Meyer Sep. 1984 29 p
(Contract DAAG29-80-C-0041)
(AD-A149455; MRC-TSR-2746) Avail: NTIS HC A03/MF A01 CSCL 12/1

Unreplicated fractional factorial designs are frequently employed as screening designs when it is believed that a condition of effect sparisity will ensure that only a few of the possible effects are likely to be large. After considering the concept of effect sparisity as a justification for the use of unreplicated fractional designs, we discuss the situation where factors may influence not only the location but also the dispersion of the data. The aliasing of location and dispersion effects is explored and methods for identifying an appropriate location - dispersion model are considered. GRA

N85-19761# Wisconsin Univ., Madison. Mathematics Research Center.
A NEW METHOD OF APPROXIMATING NORMAL AND t-TAIL AREAS Technical Summary Report
A. P. Soms Sep. 1984 11 p
(Contract DAAG29-80-C-0041)
(AD-A149457; MRC-TSR-2750) Avail: NTIS HC A02/MF A01 CSCL 12/1

The bounds of Boyd and Soms for the tail areas of the normal and t-distributions are used to obtain a new method of approximating the tail areas. The absolute and relative errors are given. A reasonable accurate and simple method of evaluating normal and t-tail areas and percentiles is described. This approach controls both absolute and relative errors, unlike the usual methods which only control the absolute error. The control of both errors is of importance in calculating Bonferroni percentiles and Bonferroni descriptive probability levels, which are useful in simultaneous inference. For example, a nonspecialist in statistics, unaware of the limitations of standard routines, might report a Bonferroni descriptive probability level that had a relative error of 100% or more. GRA

N85-19762# State Univ. of New York, Stony Brook. Dept. of Applied Mathematics and Statistics.
BOUNDING THE STOCHASTIC PERFORMANCE OF CONTINUUM STRUCTURE FUNCTIONS 2
L. A. Baxter and C. Kim Nov. 1984 16 p
(Grants NSF ECS-83-06871; AF-AFOSR-0243-84)
(AD-A149458; AFOSR-84-1201TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document describes bounding the Stochastic performance of a continuum structure function gamma which is a nondecreasing mapping from the unit hypercube to the unit interval. GRA

N85-19763# North Carolina Univ., Chapel Hill. Dept. of Statistics.
CHARACTERISTIC FUNCTIONAL OF A PROBABILITY MEASURE ABSOLUTELY CONTINUOUS WITH RESPECT TO A GAUSSIAN RADON MEASURE
H. Sato Aug. 1984 33 p
(Contract N00014-81-K-0373; Proj. 042)
(AD-A149482; LISS-11) Avail: NTIS HC A03/MF A01 CSCL 12/1

Let micron and micron sub 1 probability measures on a locally convex Hausdorff real topological linear space E. C.R. Baker posed the problem of characterizing the absolute continuity of micron and micron sub 1 by their characteristic functionals. The aim of this paper is to give an answer to this problem in the case where micron is a Gaussian Radon measure. We shall define a Fourier transform, establish the inversion formula, and then give a necessary and sufficient condition for micron sub 1 to be absolutely continuous with respect to micron based on the characteristic functional. As applications, for the convolution micron sub 1 = micron sub v, where v is a Radon measure on E, we shall give some concrete sufficient conditions on v for micron sub v << micron. Author (GRA)

N85-19764# Wisconsin Univ., Madison. Mathematics Research Center.
PERIODIC SOLUTIONS OF PRESCRIBED ENERGY FOR A CLASS OF HAMILTONIAN SYSTEMS Technical Summary Report
V. Benci (Pisa Univ.) and P. H. Rabinowitz Sep. 1984 41 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-81-10556)
(AD-A149487; MRC-TSR-2748) Avail: NTIS HC A03/MF A01 CSCL 12/1

Hamiltonian systems of ordinary differential equations model the motion of a discrete mechanical system when no frictional forces are present. A basic property of such systems is that energy is conserved. Therefore solutions of Hamiltonian systems lie on surfaces of fixed energy. The main result of this paper is a fairly general criterion for such a surface to possess a periodic solution. GRA

N85-19765# Virginia Polytechnic Inst. and State Univ., Blacksburg.
BLUNDER DETECTION USING A SEQUENTIAL LEAST SQUARES ADJUSTMENT M.S. Thesis
D. A. Campbell Nov. 1984 121 p
(AD-A149514) Avail: NTIS HC A06/MF A01 CSCL 12/1

Blunder detection is a key step in achieving optimal results from a least squares adjustment. One approach to blunder detection is to employ a detection algorithm in a sequential least squares adjustment. A sequential adjustment technique compares the variability of the observations added sequentially to that of the observations already incorporated into the solution. The rejection criterion for observations is based upon an F-statistic. The F-statistic is formed by the ratio of key, independent quadratic forms of residuals corresponding to the observations added sequentially and those already accepted in the solution. Neither an a priori nor an a posteriori reference variance is required for the blunder detection algorithm. The sequential algorithm is computationally efficient because it combines the least squares adjustment and the blunder detection into one step. The sequential least squares blunder detection algorithm is programmable and is tested on measured data sampled from a simple model, a straight line. Author (GRA)

N85-19766# Georgia Inst. of Tech., Atlanta. Production and Distribution Research Center.
ORDER PICKING IN AN AISLE
M. Goetschalckx and H. D. Ratliff Sep. 1984 31 p
(Contract N00014-83-K-0147)
(AD-A149553; PDRC-83-11) Avail: NTIS HC A03/MF A01 CSCL 12/1

A classical order picking problem is the case where items have to be picked from both sides of an aisle and the picker cannot reach items on both sides simultaneously. Hence the picker must cross the aisle one or more times. Efficient optimal algorithms are developed for the cases where the picker enters and exits the aisle at the same end or at opposing ends. For all practical aisle widths and number of picks in an order, it is more efficient to enter and exit the aisle at opposing ends. The algorithms

can be implemented in real time on a microcomputer. An optimal fixed picking sequence, suitable for implementation in a manual system is also developed and compared with the optimal policy. GRA

N85-19767# Wisconsin Univ., Madison. Mathematics Research Center.
NUMERICAL SOLUTION OF SEMILINEAR ELLIPTIC PROBLEMS ON UNBOUNDED DOMAINS Technical Summary Report
T. M. Hagstrom and H. B. Keller Sep. 1984 31 p
(Contracts DAAG29-80-C-0041; DE-AS03-76SF-00767)
(AD-A149559; MRC-TSR-2754) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document presents the derivation and implementation of asymptotic boundary conditions at artificial boundaries for semilinear elliptic boundary value problems on semi-infinite cylindrical domains. A general theory developed by the authors in a previous work is applied to establish the existence of exact boundary conditions and to obtain useful approximations to them. These are based on the Laplace transform solution of the linearized problem at infinity. The authors discuss the incorporation of these conditions in a finite difference scheme and present the results of a numerical experiment: the solution of the Bratu problem in a two dimensional stepped channel. They also examine certain problems concerning the existence of solutions on infinite domains. GRA

N85-19768# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
THE INEFFICIENCY OF LEAST SQUARES: EXTENSIONS OF KANTOROVICH INEQUALITY
C. R. Rao Nov. 1984 12 p
(Contract F49620-82-K-0001)
(AD-A149568; TR-84-47; AFOSR-84-1199TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Four different measures of inefficiency of the simple least squares estimator in the general Gauss-Markoff model are considered. Previous work on the bounds to some of these measures is briefly reviewed and new bounds are obtained for a particular measure. Author (GRA)

N85-19769# California Univ., Livermore. Lawrence Livermore Lab.
DOMAIN DECOMPOSITION TECHNIQUES FOR SOLVING ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS ON MULTIPROCESSORS
J. H. Simon May 1984 66 p refs
(Contract W-7405-eng-48)
(DE85-004448; UCRL-53578) Avail: NTIS HC A04/MF A01

Results from a simulation study of certain matrix iterative methods that could be efficiency implemented on an arbitrary multiprocessor configurations are analyzed. The background matrix theory and notation are introduced. Possible splittings for the preconditioned conjugate gradient method and numerical results are presented. In addition, the Schwarz Alternating Principle, the Schwarz numeric iteration, and interesting results for arbitrary splitting a domain for multiprocessing are discussed. The Laplace equation with Dirichlet boundary conditions is used as a numerical model for simulation and developing insight into domain decomposition for multiprocessing. DOE

N85-19770# New York Univ., New York. Mathematics and Computing Lab.
CONSTRUCTION OF SOLUTIONS FOR TWO-DIMENSIONAL RIEMANN PROBLEMS
W. B. Lindquist Sep. 1984 31 p refs
(Contract DE-AC02-76ER-03077)
(DE85-003136; DOE/ER-03077/228) Avail: NTIS HC A03/MF A01

Solutions to the scalar quasilinear equation with initial data given by a two dimensional Riemann problem are piecewise smooth if f1 identical with f2 identical and f, and f has at most one inflection point. It is show that the pieces of this solution can be classified and are expressible in terms of two dimensional non-linear waves in analogy with the non-linear rarefaction and shock waves of the Riemann problem in one spatial dimension. The two dimensional waves can be expressed in almost closed form. Explicit solutions are constructable from these waves. An application is illustrated by calculation of the interaction of water/oil banks in two phase incompressible flow in reservoirs. DOE

N85-19771# European Space Agency, Paris (France).
CONTRIBUTION TO THE STUDY OF A NUMERICAL IMPLICIT METHOD FOR SOLVING THE EULER EQUATIONS
Virginie Daru Oct. 1984 137 p refs Transl. into ENGLISH of "Contrib. a lEtude dune Methode Numer. Implicite pour Resoudre les Equations dEuler" ONERA-NT-1983-8, Paris, 1983 Original language doc. was announced as N84-25958
(ESA-TT-872; ONERA-NT-1983-8) Avail: NTIS HC A07/MF A01

Numerical implicit schemes to solve hyperbolic systems of conservation laws are applied to the calculation of flows around wing profiles using the Euler equations. A linear stability analysis of these schemes taking the boundary conditions into account is presented. The theoretical results are confirmed by numerical experiments and show the importance of the choice of the boundary conditions on the stability of the global approximation. It is shown that the rate of convergence of the implicit method to reach a steady solution is directly connected with the behavior of the amplification factor of the scheme when the time step is large. The numerical experiments show the efficiency of the scheme in the one dimensional case. A way to extend the scheme to two space variables is presented. Author (ESA)

N85-19247*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CODES WITH PARITY CONDITIONS ON SUBSETS OF COORDINATES
document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 12A

N85-19674# Freie Univ., Berlin (West Germany).
TOWARDS THE CONSTRUCTION OF PERIODIC SOLUTIONS OF PSEUDODIFFERENTIAL EQUATIONS WITH THE AID OF ALGEBRAIC OPERATORS [ZUR KONSTRUKTION PERIODISCHER LOSUNGEN VON PSEUDODIFFERENTIALGLEICHUNGEN MIT HILFE VON OPERATIORENALGEBREN]
Karl Doppel and Niels Jacob *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 193-217 refs In GERMAN (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19675# San Diego State Univ., Calif. Dept. of Mathematics.
DOMAINS WITH LIPSCHITZ MAPPING FUNCTIONS
Frank David Lesley *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 219-233 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19678# Helsinki Univ. (Finland). Dept. of Mathematics.
DIFFEOMORPHIC APPROXIMATION OF QUASICONFORMAL AND QUASISYMMETRIC HOMEOMORPHISMS
Maire Kiikka *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 251-256 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19681# Open Univ., Milton (England). Dept. of Mathematics.
ON HARMONIC FUNCTIONS WITH INTEGRABLE MAXIMUM MODULUS
J. G. Clunie and P. J. Rippon *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 333-341 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

E. C. Posner and Z. Reichstein *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 236-247 refs (For primary

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-19772# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
ON THE PROBABILITY DENSITY OF SIGNAL-TO-NOISE RATIO IN AN IMPROVED ADAPTIVE DETECTOR, PART 1 Final Report, 15 Apr. 1981 - 30 Sep. 1984
I. Kirsteins and D. W. Tufts Oct. 1984 81 p 2 Vol.
(Contract N00014-81-K-0144)
(AD-A148856) Avail: NTIS HC A05/MF A01 CSCL 12/1

This document describes an approximate probability distribution for the SNR (signal-to-noise ratio) of an improved adaptive detector in near rank-1 Gaussian noise where the filter weights are computed using the principal eigenvectors of the estimated noise covariance matrix. The noise consists of two components, a strong rank-1-covariance matrix. The noise consists of two components, a strong rank-1-covariance interference component plus white noise. Computer simulation is used to verify the approximating SNR distribution and show that it is accurate even for small sample size and low interference-to-noise ratios. GRA

N85-19773# North Carolina Univ., Chapel Hill. Dept. of Statistics.
MORE LIMIT THEORY FOR THE SAMPLE CORRELATION FUNCTION OF MOVING AVERAGES
R. A. Davis and S. Resnick Sep. 1984 35 p
(Contract F49620-82-C-0009; Grant NSF DMS-82-02335)
(AD-A148975; TR-72; AFOSR-84-1151TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document summarizes results describing the limit laws for the sample correlation function of moving averages. GRA

N85-19774# Stanford Univ., Calif. Dept. of Statistics.
W.E. JOHNSON'S SUFFICIENTNESS POSTULATE
S. L. Zabell 22 Nov. 1984 26 p
(Contract N00014-76-C-0475)
(AD-A149014; SU-TR-350) Avail: NTIS HC A03/MF A01 CSCL 12/1

How do Bayesians justify using conjugate priors on grounds other than mathematical convenience? In the 1920's the Cambridge philosopher William Ernest Johnson in effect characterized symmetric Dirichlet priors for multinomial sampling in terms of a natural and easily assessed subjective condition. Johnson's proof can be generalized to include asymmetric Dirichlet priors and those finitely exchangeable sequences with linear posterior expectation of success. Some interesting open problems that Johnson's result raises, and its historical and philosophical background are also discussed. GRA

N85-19775# Wisconsin Univ., Madison. Mathematics Research Center.
ROBUST KALMAN FILTERING AND ITS APPLICATIONS
Irwin Guttman (Toronto Univ., Canada) and Daniel Pena (Univ. Politecnica de Madrid) Oct. 1984 36 p
(Contract DAAG29-80-C-0041)
(AD-A149044; MRC-TSR-2766) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper presents a robust Kalman filtering algorithm that is obtained assuming a scale contaminated normal distribution for the noise of the measurement equation. The mixture of normals obtained as a posterior distribution is approximated at each stage by a normal distribution with the same mean and variance. The resulting algorithm is simple, has a straightforward interpretation and seems to provide useful robust estimators in several statistical problems that are briefly reviewed. GRA

N85-19776# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
MODELLING AND RESIDUAL ANALYSIS OF NONLINEAR AUTO-REGRESSIVE TIME SERIES IN EXPONENTIAL VARIABLES
P. A. W. Lewis and A. J. Lawrence (Birmingham Univ., England) Aug. 1984 39 p
(Contract N00014-84-WR-24004)
(AD-A149047; NPS55-84-019) Avail: NTIS HC A03/MF A01 CSCL 12/1

An approach to modelling and residual analysis of nonlinear autoregressive time series in exponential variables is presented; the approach is illustrated by analysis of a long series of wind velocity data which has first been detrended and then transformed into a stationary series with an exponential marginal distribution. The stationary series is modelled with a newly developed type of second order autoregressive process with random coefficients, called the NEAR(2) model; it has a second order autoregressive correlation structure but is nonlinear because its coefficients are random. The exponential distributional assumptions involved in this model highlight a very broad four parameter structure which combines five exponential random variables into a sixth exponential random variable; other applications of this structure are briefly considered. Dependency in the NEAR(2) process not accounted for by standard autocorrelations is explored by developing a residual analysis for time series having autoregressive correlation structure; this involves defining linear uncorrelated residuals which are dependent, and then assessing this higher order dependence by standard time series computations. Application of this residual analysis to the wind velocity data illustrates both the utility and difficulty of nonlinear time series modelling. GRA

N85-19777# Wisconsin Univ., Madison. Mathematics Research Center.
REGENERATIVE STRUCTURE OF MARKOV CHAINS SIMULATED VIA COMMON RANDOM NUMBERS
Peter W. Glynn Oct. 1984 14 p
(Contract DAAG29-80-C-0041; Grant NSF ECS-84-04809)
(AD-A149092; MRC-TSR-2765) Avail: NTIS HC A02/MF A01 CSCL 12/1

A standard strategy in simulation, for comparing two stochastic systems, is to use a common sequence of random numbers to drive both systems. Certain theoretical and methodological results require that the coupled system be regenerative. It is shown that if the stochastic systems are Markov chains with countable state space, then the coupled system is necessarily regenerative. An example is given which shows that the regenerative property can fail to hold in general state space, even if the individual systems are regenerative. GRA

N85-19778# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
ON LARGE MATCHINGS AND CYCLES IN SPARSE RANDOM GRAPHS
A. M. Frieze Jan. 1984 27 p
(Contract N00014-75-C-0621)
(AD-A149194; MSRR-504) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper studied the size of the largest matching and cycle in random graphs with edge probability c/n where c is a large constant. GRA

N85-19779# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
THE ASYMPTOTIC BEHAVIOR OF THE LIKELIHOOD RATIO STATISTIC FOR TESTING A SHIFT IN MEAN IN A SEQUENCE OF INDEPENDENT NORMAL VARIATES
Y. C. Yao and R. A. Davis Sep. 1984 18 p
(Contract F49620-82-C-0009)
(AD-A149329; TR-80; AFOSR-84-1152TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document considers the problem of testing a sequence of independent and normally distributed random variables with

common mean against alternatives involving a shift in the mean at an unknown time point. The purpose of this paper is to study the asymptotic operating characteristics of the likelihood ration test. In the next section, the authors derive, by invoking a result of Darling and Erdos (1956), the asymptotic null distribution of the likelihood ration test, which is related to the extreme value behavior of the Ornstein-Uhlenbeck process. Section 3 studies the asymptotic operating characteristics of the likelihood ratio test and make comparisons between likelihood ration and Bayesian tests. GRA

N85-19780# Wisconsin Univ., Madison. Mathematics Research Center.
ESTIMATION OF VARIANCE OF THE REGRESSION ESTIMATOR Technical Summary Report
L. Y. Deng and C. F. J. Wu 10 Oct. 1984 37 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-83-00140)
(AD-A149407; MRC-TSR-2758) Avail: NTIS HC A03/MF A01 CSCL 12/1

For estimating the variance of the regression estimator in simple random sampling without replacement, several design-based and model-based estimators and a new class of estimators are compared. Their second order expressions and biases are derived and compared. Empirical results on the biases and MSE's (Mean Squared Errors) of the variance estimators and the conditional and unconditional coverage probabilities of their associated t-intervals lend support to the theoretical results and suggest further questions. GRA

N85-19781# Wisconsin Univ., Madison. Mathematics Research Center.
ASYMPTOTIC DISTRIBUTIONS OF THE SAMPLE MEAN, AUTOCOVARIANCES AND AUTOCORRELATIONS OF LONG-MEMORY TIME SERIES Technical Summary Report
J. R. M. Hosking Sep. 1984 34 p
(Contract DAAG29-80-C-0041)
(AD-A149409; MRC-TSR-2752) Avail: NTIS HC A03/MF A01 CSCL 12/1

Persistence, or long memory, is the presence in a time series of significant dependence between observations a long time span apart. Correct identification of long memory in an observed time series can greatly improve the accuracy of long-range forecasts of the series, and can give a better understanding of the physical processes which generate the observed series. The long-memory phenomenon has been observed by researchers in a number of areas of application including economics, geophysics, hydrology and meteorology. This report derives the distributions of the sample autocorrelations and related quantities when the samples size is large, thereby facilitating the diagnosis of long memory in an observed time series. GRA

N85-19782# Florida State Univ., Tallahassee. Dept. of Statistics.
THE CODING CAPACITY OF MISMATCHED GAUSSIAN CHANNELS Technical Report
I. W. McKeaque and C. R. Baker (North Carolina Univ., Chapel Hill) Sep. 1984 20 p
(Contracts N00014-81-K-0373; N00014-75-C-04912; DAAG29-82-K-0168; NR Proj. 042)
(AD-A149453; LISS-12) Avail: NTIS HC A02/MF A01 CSCL 09/4

Bounds on the coding capacity of Gaussian channels are obtained when the power constraint is mismatched to the channel noise. In the case of some feedback channels in which the noise has a Cramer-Hida representation of finite multiplicity, an exact expression for the coding capacity is given. GRA

N85-19783# Wisconsin Univ., Madison. Mathematics Research Center.
THE LIKELIHOOD DISPLACEMENT: A UNIFYING PRINCIPLE FOR INFLUENCE MEASURES Technical Summary Report
R. D. Cook, D. Pena, and S. Weisberg Sep. 1984 25 p
(Contract DAAG29-80-C-0041)
(AD-A149456; MRC-TSR-2751) Avail: NTIS HC A02/MF A01 CSCL 12/1

The young field of statistical diagnostics has produced an array of competing statistics for measuring the influence of individual cases. The identification of influential cases seem generally accepted as an important part of linear regression analysis. Although there are many diagnostic methods available for this, two specific diagnostic statistics - d sub i as proprosed by Cook, and DFFITS sub i as proposed by Belsley, Kuh and Welsch (1980) - appear to be used most frequently since they are available in many widely distributed regression packages. For further progress and a deeper understanding of available methodology, larger perspectives seem necessary. GRA

N85-19682# Stockholm Univ. (Sweden). Dept. of Mathematics.
CONDENSER CAPACITIES AND REMOVABLE SETS IN W1p1
Torbjorn Kolsrud *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 343-348 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-19784*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IDENTIFICATION OF DYNAMIC SYSTEMS, THEORY AND FORMULATION
Richard E. Maine and Kenneth W. Iliff Feb. 1985 138 p refs
(NASA-RP-1138; H-1255; NAS 1.61:1138; AGARDograph-300)
Avail: NTIS HC A07/MF A01 CSCL 12B

The problem of estimating parameters of dynamic systems is addressed in order to present the theoretical basis of system identification and parameter estimation in a manner that is complete and rigorous, yet understandable with minimal prerequisites. Maximum likelihood and related estimators are highlighted. The approach used requires familiarity with calculus, linear algebra, and probability, but does not require knowledge of stochastic processes or functional analysis. The treatment emphasizes unification of the various areas in estimation in dynamic systems is treated as a direct outgrowth of the static system theory. Topics covered include basic concepts and definitions; numerical optimization methods; probability; statistical estimators; estimation in static systems; stochastic processes; state estimation in dynamic systems; output error, filter error, and equation error methods of parameter estimation in dynamic systems, and the accuracy of the estimates. Author

N85-19785*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMPROVING ENGINEERING SYSTEM DESIGN BY FORMAL DECOMPOSITION, SENSITIVITY ANALYSIS, AND OPTIMIZATION
Jaroslaw Sobieski and Jean-Francois Barthelemy (Virginia Polytechnic Inst. and State Univ.) Feb. 1985 10 p refs Proposed for presentation at the Intern. Conf. on Eng. Design, ICED 85, Hamburg, 26-28 Aug. 1985
(NASA-TM-86377; NAS 1.15:86377) Avail: NTIS HC A02/MF A01 CSCL 12B

A method for use in the design of a complex engineering system by decomposing the problem into a set of smaller subproblems is presented. Coupling of the subproblems is preserved by means of the sensitivity derivatives of the subproblem solution to the inputs received from the system. The method allows for the division of work among many people and computers. Author

N85-19786# Georgia Inst. of Tech., Atlanta.
SPACEFILLING CURVES AND THE PLANER TRAVELLING SALESMAN PROBLEM
L. K. Platzman and J. J. Bartholdi, III Oct. 1984 21 p Revised

(Contract N00014-80-K-0709; Grant NSF ECS-83-51313)
(AD-A149337) Avail: NTIS HC A02/MF A01 CSCL 12/2

This paper analyzes the performance of a novel heuristic to obtain the minimal-length tour of N given points in the plane: they are sequenced as they appear along a spacefilling curve. The algorithm consists essentially of sorting, so it is easily coded and requires only O(N) memory and O(N log N) operations. Its performance is shown to be competitive with that of other available methods. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-19787# Wisconsin Univ., Madison. Mathematics Research Center.
A REMARK ON REGULARIZATION IN HILBERT SPACES
J. M. Lasry and Pierre Louis Lions (Univ. Paris-Dauphine) Oct. 1984 15 p
(Contract DAAG29-80-C-0041)
(AD-A149046; MRC-TSR-2760) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is well-known that in finite dimensions one may regularize continuous functions (using convolution for example). The usual methods to do so fail in infinite dimensional Hilbert spaces. This document proposes a method to solve this difficulty, which is based upon explicit formula that are called inf-convolution formulas. GRA

N85-19788# Georgia Inst. of Tech., Atlanta. Production and Distribution Research Center.
HEURISTICS BASED ON SPACEFILLING CURVES FOR COMBINATORIAL PROBLEMS IN THE PLANE
J. J. Bartholdi, III and L. K. Platzman Sep. 1984 35 p
(Contract N00014-83-K-0147; Grant NSF ECS-83-51313)
(AD-A149320; PDRC-84-08) Avail: NTIS HC A03/MF A01 CSCL 12/1

We introduce a family of heuristics, based on spacefilling curves, to solve general combinatorial problems in the plane, such as routing, location, and clustering. These remarkably simple and fast heuristics are nonetheless fairly accurate and so seem well-suited to operational problems where time or computing resources are limited. They ignore many details of the problem, yet generate solutions that are good simultaneously with respect to a variety of measures. (This may be useful when the problem specification is incomplete or cannot be agreed upon.) Furthermore, they are extremely simple to code, and in some cases may even be implemented without a computer. GRA

N85-19789# Wisconsin Univ., Madison. Mathematics Research Center.
CONNECTED SIMPLE SYSTEMS AND THE CONLEY INDEX OF ISOLATED INVARIANT SETS Technical Summary Report
D. Salamon Sep. 1984 78 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A149383; AD-F300533; MRC-TSR-2753) Avail: NTIS HC A05/MF A01 CSCL 12/1

The Conley index is an extremely useful tool for the study of structural properties of isolated invariant sets such as critical points or periodic solutions in local flows. The continuation theorem shows that the properties of the flow which are described by the Conley index are among those which are invariant under perturbations. This is a fact of great interest in many applications. Most of the results in the present paper are not new. The object of this work is to give a self-contained presentation of most of the basic concepts and theorems in the index theory for flows which can otherwise only be found in a number of different papers. Moreover, we have simplified a number of the complicated proofs. GRA

N85-19676# Helsinki Univ. (Finland). Dept. of Mathematics.
ON THE SPHERICAL DERIVATIVE OF A MEROMORPHIC FUNCTION WITH A NEVANLINNA DEFICIENT VALUE
Sakari Toppila *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 235-245 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19677# Helsinki Univ. (Finland). Dept. of Mathematics.
SIMPLIFIED PROOFS OF SOME BASIC THEOREMS FOR QUASIREGULAR MAPPINGS
Marthi I. Pesonen *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 247-250 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19679# Warsaw Univ. (Poland). Dept. of Mathematics.
ANALYTICAL FOUNDATIONS OF THE THEORY OF QUASICONFORMAL MAPPINGS IN Rn
B. Bojarski and T. Iwaniec *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 257-324 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19680# Karlsruhe Univ. (West Germany).
LOCALLY UNIVALENT FUNCTIONS IN THE UNIT DISK
Norbert Steinmetz *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 325-332 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19683# Freie Univ., Berlin (West Germany).
CLOSE-TO-CONVEX FUNCTIONS AND LINEAR-INVARIANT FAMILIES
Wolfram Koepf *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 349-355 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19684# Mohammed V Univ., Rabat (Morocco).
ON THE INTEGRAL REPRESENTATION OF BISUBHARMONIC FUNCTIONS IN Rn
Victor Anandam *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 357-367 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19685# Helsinki Univ. (Finland). Dept. of Mathematics.
SOLUTIONS OF PROBLEMS OF MILLER AND RUBEL
Sakari Toppila *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 369-370 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19686# Joensuu Univ. (Finland). Dept. of Mathematics and Physics.
ON ROTATION AUTOMORPHIC FUNCTIONS WITH DESCRETE ROTATION GROUPS
Rauno Aulaskari *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 371-373 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

N85-19687# Freie Univ., Berlin (West Germany).
A NON-HYPOELLIPTIC DIRICHLET PROBLEM FROM STOCHASTICS
Karl Doppel and Niels Jacob *In* Suomalainen Tiedeakatemia Annuals of the Finnish Acad. of Sci., Ser. A, 1, Vol. 8, Pt. 2 1983 p 375-389 refs (For primary document see N85-19673 10-59)
Avail: Issuing Activity

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

No abstracts in this category.

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N85-19790*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLUCTUATING PRESSURES ON FAN BLADES OF A TURBOFAN ENGINE, FLIGHT TEST INVESTIGATION
James A. Schoenster Feb. 1985 26 p refs
(NASA-TP-2381; L-15700; NAS 1.60:2381) Avail: NTIS HC A03/MF A01 CSCL 20A

Miniature pressure transducers were used to measure the fluctuating pressure on the fan blades of a JT15D engine in flight to aid in understanding fan-noise generation. Although the blade pressures can be considered very useful in determining far-field noise sources in the subsonic fan-blade tip speeds, other mechanisms, and as shock waves in the transonic and supersonic fan-blade tip speeds, limit their usefulness in these higher speed ranges.
Author

N85-19791*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
EFFECTS OF VANE/BLADE RATIO AND SPACING ON FAN NOISE, VOLUME 1 Final Technical Report
P. R. Gliebe (GE, Cincinnati) and R. A. Kantola Dec. 1983 164 p refs 2 Vol.
(Contract NAS3-22062)
(NASA-CR-174664; NAS 1.26:174664; GE-84SRD006-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 20A

The noise characteristics of a high-speed fan were studied. The experimental investigation was carried out on a 50.8 cm (20 in.) diameter scale model fan stage in an anechoic chamber with an inflow turbulence control screen installed. The forty-four blade rotor was tested with forty-eight vane and eighty-six vane stator rows, over a range of aixal rotor-stator spacings from 0.5 to 2.3 rotor tip chords. A two-dimensional strip theory model of rotor-stator interaction noise was employed to predict the measured tone power level trends, and good overall agreement with measured trends was obtained.
A.R.H.

N85-19792*# General Electric Co., Schenectady, N. Y.
EFFECTS OF VANE/BLADE RATIO AND SPACING ON FAN NOISE. VOLUME 2: DATA SUPPLEMENT Final Report
P. R. Gliebe and R. A. Kantola Dec. 1983 359 p 2 Vol.
(Contract NAS3-22062)
(NASA-CR-174665; NAS 1.26:174665; GE-84SRD006-Vol-2; DS-3-Vol-2) Avail: NTIS HC A16/MF A01 CSCL 20A

Complete tabulations of 1/3-octave band acoustic measurements are given.
Author

N85-19793# Georgetown Univ., Washington, D.C. Dept. of Physics.
LINEAR AND NONLINEAR ULTRASONIC INTERACTION ON LIQUID-SOLID BOUNDARIES Final Report, Sep. 1978 - Sep. 1984
W. G. Mayer Nov. 1984 16 p
(Contract N00014-78-C-0584; RR0-1108)
(AD-A148979; GUUS-11848-F; FTR-1) Avail: NTIS HC A02/MF A01 CSCL 20/1

This final technical report lists tasks performed and titles and abstracts of all publications originating from a contract during this reporting period. The experimental and theoretical work performed under this contract was concerned with linear and nonlinear ultrasonic interactions on liquid-solid boundaries. The objectives of the project centered around the fact that propagation characteristics of water-borne ultrasonic signals are frequently explained and various calculations are done by applying a plane wave theory. This approach can, to a good approximation, explain some observed results of sound propagation, reflection, and transmission phenomena but fails to describe these effects whenever the sonic signal is confined to a bounded beam or when a solid reflector has a thickness which is comparable to the sonic wavelength or when the medium of propagation is nonlinear or when the reflecting solid is itself nonlinear, i.e., if its response to an impinging sonic signal depends on the beam width and frequency. The objective of the present project thus was the theoretical and experimental investigation of the propagation, reflection, and transmission of a bounded sonic beam in a nonlinear layered medium.
GRA

N85-19794# Spectron Development Labs., Inc., Costa Mesa, Calif.
AN ELECTRO-OPTIC SPATIAL LIGHT MODULATOR FOR THERMO-ELASTIC GENERATION OF PROGRAMMABLY FOCUSED ULTRASOUND
J. D. Trolinger 27 Jul. 1984 4 p
(Contract N00014-84-C-0058)
(AD-A149078; SDL-84-2361-01) Avail: NTIS HC A02/MF A01 CSCL 10/1

The objective of the program is to produce a device which is capable of converting light energy into ultrasound energy and, by suitable coupling to a solid or liquid target, produce a focusing of the sound within the target.
GRA

N85-19795# Naval Ocean Systems Center, San Diego, Calif.
ARCTIC ACOUSTIC PROPAGATION MODEL WITH ICE SCATTERING Final Report, May 1983 - Jun. 1984
D. F. Gordon and H. P. Bucker 30 Sep. 1984 56 p
(F59-552)
(AD-A149430; AD-E500690; NOSC/TR-985) Avail: NTIS HC A04/MF A01 CSCL 20/1

An underwater sound propagation program has been adapted to Arctic use. The program enables computation of the coherent sound field with normal modes and the incoherent surface scattered field by integrating over ray paths from the surface to the source and receiver. For Arctic use, ice scattering and ice loss functions have been developed by comparing computed losses with Arctic propagation loss data. The sensitivity of the computed losses to the form of the scattering function is determined for one frequency. A difference in ice loss between summer and winter is hypothesized, but the data are insufficient to check the hypothesis.
Author (GRA)

N85-19457# Joint Publications Research Service, Arlington, Va.
BEHAVIOR OF MODE FREQUENCY CHARACTERISTICS IN SHALLOW SEA WITH VARIATION OF P-WAVE VEOCITY IN BOTTOM SEDIMENT LAYER AND SONIC VELOCITY PROFILE IN WATER LAYER Abstract Only
N. S. Ageyeva and V. D. Krupin *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 22 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 577-584 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19458# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF BRAGG REFLECTING LATTICE GROOVE DEPTH MODULATION ON RAYLEIGH WAVE REFLECTION COEFFICIENT Abstract Only
Yu. Yu. Alyakna, Yu. V. Gulyayev, A. L. Kozlov, and V. P. Flesskiy *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 24 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 585-588 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19459# Joint Publications Research Service, Arlington, Va.
PRELIMINARY RESULTS OF STUDY OF SPACE-TIME VARIABILITY OF SHALLOW SEA ON STEADY ACOUSTICAL PATH Abstract Only
F. V. Bunkin, A. V. Vavilin, V. A. Zhuravlev, Yu. A. Kravtsov, A. Yu. Lyubchenko, N. N. Omelchenko, V. G. Petnikov, L. T. Kudiyev, and A. Yu. Shmelev *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 24 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 594-598 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19460# Joint Publications Research Service, Arlington, Va.
SPECIFICS OF BACKSCATTERING OF SOUND BY BOTTOM OF BANK IN OPEN SEA Abstract Only
A. V. Bunchuk, Yu. Yu. Zhutkovskiy, and Yu. P. Lysanov *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 25 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 599-604 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

N85-19461# Joint Publications Research Service, Arlington, Va.
AVERAGE SOUND INTENSITY DECREASE RULE IN IRREGULAR HYDROACOUSTICAL WAVEGUIDE Abstract Only
B. G. Katsnelson and L. G. Kulapin *In its* USSR Rept: Earth Sci. (JPRS-UES-85-003) 11 Feb. 1985 p 25 Transl. into ENGLISH from Akust. Z. (Moscow), no. 5, Sep. - Oct. 1984 p 643-648 (For primary document see N85-19446 10-42)
Avail: NTIS HC A04/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-19796# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
VARIATIONAL CALCULATION OF THE 2D H2 MOLECULE
M. Fabbri and A. FerreiradaSilva Oct. 1984 12 p refs Submitted for publication
(INPE-3304-PRE/615) Avail: NTIS HC A02/MF A01

The ground state energy of the two dimensional (2D) hydrogen molecule was calculated using a Heitler-London-Rosen type variational calculation. The value of the dissociation energy is found to be -2.5 Ry. For the interatomic distance R=0, the variational parameter alpha(2D)=1.7056, corresponding to a 2D He atom. For the sake of comparison, the results of the 3D case are also recalculated. Special interest arises in the Slater integrals, that are rather difficult to obtain in the 2D case. Author

N85-19797# Michigan Univ., Ann Arbor. Dept. of Nuclear Engineering.
HIGH ENERGY PULSED PARTICLE ACCELERATOR Final Report, 1 Aug. 1983 - 31 Oct. 1984
R. M. Gilgenbach 31 Oct. 1984 7 p
(Contract N00014-83-G-0157)
(AD-A149247) Avail: NTIS HC A02/MF A01 CSCL 20/7

This project was performed under the DoD University Instrumentation Program. A state-of-the-art accelerator was designed, constructed, and tested with the following parameters: Output (working) voltage: 1 Megavolt; Pulselength: Adjustable to 1 microsecond from 0.1 microsecond; Output Energy: At least 10 kJoules in 1 microsecond within voltage flatness; Current: At least 10 kA into fixed resistance 100 ohm load; Voltage deviation from flattop: Predicted to be less than + or - 7% voltage fluctuation into variable diode impedance which decreases from 300 ohms to 50 ohms during the 1 microsecond pulse. Less than + or - 5% total voltage deviation into fixed resistance load of 100 ohms. Unique circuitry was included in the generator to permit electrical compensation for diode impedance droop. Author (GRA)

N85-19798# California Univ., Berkeley. Electronics Research Lab.
SIMULATION OF THE ION-BEAM-DRIVEN DRIFT INSTABILITY IN A MAGNETIC TRAP, 2
V. A. Thomas, W. M. Nevins, and Y. J. Chen 13 Jun. 1984 49 p 2 Vol.
(Contract N00014-77-C-0578)
(AD-A149452; UCB/ERL-M84/46) Avail: NTIS HC A03/MF A01 CSCL 20/8

Recent Experiments on the TMX-U device at LLNL have indicated the possibility of a low frequency drift wave being driven unstable by the injection of neutral beams in the thermal barrier region. Nonlocal linear theory is performed for this instability using slab geometry and the electrostatic approximation. Particle simulations are used to verify the linear theory and to recover relevant nonlinear phenomena. Important nonlinear effects include: (1) ExB trapping (2) relaxation of the beam density profiles, and (3) weakly nonlinear electrons. GRA

N85-19799# San Diego State Univ., Calif. Dept. of Electrical and Computer Engineering.
ELECTRON PRODUCTION, ELECTRON ATTACHMENT, AND CHARGE RECOMBINATION PROCESS IN HIGH PRESSURE GAS DISCHARGES Annual Report, 1 Aug. 1983 - 31 Jul. 1984
L. C. Lee 17 Sep. 1984 119 p
(Grant AF-AFOSR-0314-82)
(AD-A149535) Avail: NTIS HC A06/MF A01 CSCL 07/4

A parallel-plate drift-tube apparatus was used to investigate the electron transport parameters in high gas pressure. The initial electrons were produced either by irradiation of the cathode with excimer laser photons or by two-photon-ionization of a trace of trimethylamine in high pressure gas. The transient voltage pulses due to electron motion between the electrodes were observed. The plasma decay time and the probability for electron leakage from plasma were measured as a function of the ratio of the initial charge density to the applied field. The shortening of electron conduction pulses by adding electron attaching gases to various buffer gases were investigated. The electron attachment rate constants of 02, N20, and CF4 in N2 as well as H20 in Ar, N2 and CH4 were measured at various gas concentrations and E/N. It is observed that temporary negative ions due to electron attachment to H20 and CF4 are formed. The diffusion coefficients of electrons in air were measured in the E/N = 30 - 300 Td region. Author (GRA)

N85-19800# Department of the Navy, Washington, D. C.
IREB (INTENSE RELATIVISTIC ELECTRON BEAM) CONVERTER TO ac PULSES Patent Application
M. Friedman and V. Serlin, inventors (to Navy) Filed 17 Oct. 1984 19 p
(AD-D011479; US-Patent-Appl-SN-661838) Avail: NTIS HC A02/MF A01 CSCL 10/2

A device for converting the kinetic energy of an intense relativistic electron beam (IREB) into trains of multigigawatt ac electrical pulses comprising a foilless diode for generating an IREB and injecting the IREB into one end of a drift tube is described. The device further includes a modulating circuit for modulating the IREB current while in the drift tube to obtain longitudinally spaced bunches of electrons, and a coaxial transmission line with the end of its center conductor disposed across the other end of the drift tube in the path of the IREB. A gap is disposed between the end of the drift tube and the end of the center conductor. The modulated IREB induces a voltage in the coaxial transmission line. This voltage appears across the gap to slow down the electrons and to convert the kinetic energy of the IREB into electrical energy that propagates along the coaxial transmission line. GRA

N85-19801# Brookhaven National Lab., Upton, N. Y. Dept. of Physics.
FACILITIES FOR STUDING RADIATION DAMAGE IN NONMETALS DURING IRRADIATION
Paul W. Levy Aug. 1984 13 p refs Presented at the 16th Natl. SAMPE Tech. Conf. on Mater. and Processes, Albuquerque, N. Mex., 9-10 Oct. 1984

(Contract DE-AC02-76CH-00016)
(DE85-000590; BNL-35260; CONF-841055-4) Avail: NTIS HC A02/MF A01

Two facilities were developed for making optical absorption, luminescence and other measurements on a single sample before, during and after irradiation. One facility uses Co-60 gamma rays and the other 0.5 to 3 MeV electrons from an accelerator. Optical relays function as spectrophotometers, luminescence detectors, etc. All radiation sensitive components are outside of walk-in irradiation chambers; all measurement control and data recording is computerized. Irradiations are made at controlled temperatures between 5 K and 900 C. The materials studied include glasses, quartz, alkali halides (especially natural rock salt), organic crystals, etc. As determined from color center measurements the damage formation rate in all materials studied at 25 C or above is strongly temperature dependent. The defect concentration during irradiation is usually much greater than that measured after irradiation. The fraction of defects annealing after irradiation and the annealing rate usually increases as the irradiation temperature increases. The completed studies demonstrate that, in most cases, the extent of maximum damage and the damage formation and annealing kinetics can be determined only by making measurements during irradiation. DOE

N85-19802# Los Alamos Scientific Lab., N. Mex.
PLANE-WAVE BORN COLLISION STRENGTHS FOR ELECTRON-ION EXCITATION: COMPARISON WITH OTHER THEORETICAL METHODS
R. E. H. Clark and L. A. Collins Sep. 1984 33 p refs
(Contract W-7405-eng-36)
(DE85-002348; LA-10192-MS) Avail: NTIS HC A03/MF A01

Collision strengths and rates for electron-impact excitation of atomic ions are calculaed in the plane-wave Born (PWB) approximation using the programs of Cowan and Robb. Two modifications of the PWB, which correct for the ionic threshold behavior, are investigated. Comparison is made with the distorted wave and Coulomb-Born-exchange techiques. DOE

N85-19803# California Univ., Berkeley. Lawrence Berkeley Lab.
QUANTUM MECHANICAL AND SEMICLASSICAL APPROACHES TO MOLECULAR DYNAMICS
S. Shi Sep. 1984 143 p refs
(Contract DE-AC03-76SF-00098)
(DE85-003458; LBL-18569) Avail: NTIS HC A07/MF A01

A new multichannel exchange kernel formalism for reactive scattering is introduced. The central feature of the method is the expansion of the reactive scattering wavefunction in terms of the nonreactive coupled-channel scattering waves in all of the arrangements. The exact S-matrix is found from the nonreactive wavefunction and the exchange kernel which are computed from the nonreactive coupled-channel scattering calculations in each arrangement. Semiclassical perturbation theory combined with two approximate models for polyatomic Hamiltonian, the reaction path model and the kinetic coupling model, leads to extremely simple, analytical formulae for S-matrix and the spectra of overtone. It is indicated that these simple approximate methods are of useful accuracy. A new semiclassical approach is proposed in which the evolution of the states of a system, which are parameterized by label variables, is determined by calculating the time development of the label variables classically. The formalism for calculating the S-matrix within this framework is developed. Sample calculations show that this method is very simple and describes quantum phenomena very well. DOE

N85-19804# California Univ., Livermore. Lawrence Livermore Lab.
FLOW AND PLASTICITY VIA NONEQUILIBRIUM MOLECULAR DYNAMICS
William G. Hoover 11 Jun. 1984 23 p refs Presented at Ispra EURATOM School of Computer Simulation in Phys. Met., Ispra, Italy, 21-25 May 1984
(Contract W-7405-eng-48)
(DE85-001011; UCRL-90904; CONF-8405247-3) Avail: NTIS HC A02/MF A01

The viscous flow of fluids and the plastic flow of solids, such a rnetals, are interesting from both the practical and the theoretical points of view. Atomistic molecular dynamics simulations provide a way of visualizing and understanding these flows in a detailed microscopic way. Simulations are necessarily carried out at relatively high rates of strain. For this reason they are ideally suited to the study of nonlinear flow phenomena: normal stresses induced by shear deformation, stress rotation, and the coupling of stress with heat flow, for instance. The simulations require appropriate boundary conditions, forces, and equations of motion. Newtonian mechanics is relatively inefficient for this simulation task. A modification, nonequilibrium molecular dynamics, has been developed to simulate nonequilibrium flows. Many high-strain-rate rheological studies of flowing (viscous) fluids and (plastic) solids have been carried out. The methods used in the simulations and some results obtained in this way are described. A three-body shear-flow exercise is appended to make these ideas more concrete. DOE

N85-19805# Sandia Labs., Albuquerque, N. Mex.
EXPERIMENTAL INVESTIGATION OF CERTAIN BEAM TRANSPORT ISSUES IN A PULSED TRANSMISSION LINE LINEAR ACCELERATOR
M. G. Mazarakis, R. B. Miller, S. L. Shope, L. R. Stevenson, I. P. Coleman, J. W. Poukey, R. J. Adler (Mission Research Corp.), and T. C. Genoni (Military Academy) Sep. 1984 38 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002310; SAND-84-0095) Avail: NTIS HC A03/MF A01

The successful development of a new generation of high current, high voltage, linear induction accelerators relies on the solution of a number of beam transport problems, including radial oscillations, diocotron instabilities, transverse beam break up (BBU), etc. Most of the instabilities appear to onset either at the injector region or at the accelerating gaps. Radial oscillations were first observed in RADIAC I, while transverse beam break up was first observed on the SLAC accelerator, and more recently on the ETA accelerator. A low emittance, high current, high voltage injector precisely with the guiding magnetic field axis and beam vacuum pipe axis is of prime importance for successful beam acceleration and transport. Similarly, an accelerating gap design which maintains radial force balance and an accelerating cavity with low Q and very small transverse shunt impedance Z/sub perpendicular/ should eliminate the most dangerous radial oscillations and beam break up instabilities. The design and experimental studies of a new 4 MeV, 40 kA electron beam injector and accelerating gap will be presented. DOE

N85-19806# California Univ., Livermore. Lawrence Livermore Lab.
SURVEY OF INITIAL EXPERIMENTS ON ATA BEAM DYNAMICS
D. S. Prono, G. J. Caporaso, Y. P. Chong, T. J. Fessenden, R. E. Hester, E. J. Lauer, T. J. Orzechowski, A. C. Paul, and J. T. Weir 25 Jun. 1985 33 p refs
(Contract W-7405-eng-48)
(DE85-004410; UCID-20264) Avail: NTIS HC A03/MF A01

The advanced test accelerator (ATA) is a linear induction electron accelerator whose design parameters are 50 MeV, 10 kA and 70 ns pulse duration. The key physics issues affecting performance of the accelerator involve beam dynamics during transport through the accelerator structure. Experimental results describing the initial operating phases of ATA are presented. The results illustrate the complexity of the beam transport phenomena but also indicate the means to stabilize beam dynamics. Improvements in beam transport, which result from deploying various stabilization techniques, are also presented. DOE

N85-19807# California Univ., Livermore. Lawrence Livermore Lab.
BRIGHTNESS LIMITATIONS IN MULTI-KILOAMPERE ELECTRON BEAM SOURCES
W. A. Barletta, J. K. Boyd, A. C. Paul, and D. S. Prono (California

Univ. Lawrence Berkeley Lab.) 24 Aug. 1984 22 p refs Presented at the Free Electron Laser Conf., Castelgandolfo, Italy, 3-7 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE84-017417; UCRL-90914; CONF-8409144-1) Avail: NTIS HC A02/MF A01

Heuristic relationships such as the Lawson-Penner criterion, used to scale Free Electron Laser (FEL) amplifier gain and efficiency over orders of magnitude in beam current and brightness, have no fundamental basis. The brightness of a given source is set by practical design choices such as peak voltage, cathode type, gun electrode geometry, and focusing field topology. The design of low emittance, high current electron guns has received considerable attention at Livermore over the past few years. The measured brightnesses of the Experimental Test Accelerator (ETA) and Advanced Test Accelerator (ATA) guns are less than predicted with the EBQ gun design code; this discrepancy is due to plasma effects from the present cold, plasma cathode in the code. The EBQ code is well suited to exploring the current limits of gridless relativistic Pierce columns with moderate current density (< 50 A/cm(2)) at the cathode. As EBQ uses a steady-state calculation it is not amenable for study of transient phenomena at the beam head. For this purpose, a Darwin approximation code, DPC, was written. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-19808# Sandia Labs., Albuquerque, N. Mex. Advanced Nuclear Reactors Div.
SAFETY PROGRAM CONSIDERATIONS FOR SPACE NUCLEAR REACTOR SYSTEMS
L. O. Cropp Aug. 1984 26 p
(Contract DE-AC04-76DP-00789)
(DE85-003295; SAND-84-1653) Avail: NTIS HC A03/MF A01

The necessity for in-depth safety program planning for space nuclear reactor systems is discussed. The objectives of the safety program are enumerated and a proposed task structure is presented for meeting those objectives. A proposed working relationship between the design and independent safety groups is suggested. Examples of safety-related design philosophies are given. DOE

N85-19809# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
ROCK MECHANICS: ISSUES AND RESEARCH NEEDS IN THE DISPOSAL OF WASTES IN HYDRAULIC FRACTURES
Thomas Doe and William C. McClain (RE/SPEC. Inc.) Jul. 1984 48 p refs
(Contract DE-AC03-76SF-00098)
(DE85-001399; LBL-17635) Avail: NTIS HC A03/MF A01

Proposed rock mechanics studies are outlined which are designed to answer basic questions concerning hydraulic fracturing for waste disposal. These questions are: (1) how can containment be assured for Oak Ridge or other sites; and (2) what is the capacity of a site. The suggested rock mechanics program consists of four major tasks: (1) numerical modeling; (2) laboratory testing; (3) field testing; and (4) monitoring. These tasks are described. DOE

N85-19810# Los Alamos Scientific Lab., N. Mex.
STOCHASTIC METHODS FOR THE DESCRIPTION OF MULTI-PARTICLE PRODUCTION
P. Carruthers 1984 11 p refs Presented at the Workshop on Anti PP Options for the SSC, Chicago, 13 Feb. 1984
(Contract W-7405-eng-36)
(DE84-009981; LA-UR-84-1009; CONF-840275-5) Avail: NTIS HC A02/MF A01

Dynamic questions in the evolution of excited hadronic matter are reviewed, with emphasis on KNO scaling and its possible violation. It is suggested that the KNO distribution is described by a stochastic evolution of the Fokker-Planck type related to underlying field theory by coupled rate equations approximated by Langevin equations with noise. Refined correlation analysis of data, especially the use of intensity interferometry techniques, is recommended for data analysis. DOE

N85-19811# Argonne National Lab., Ill.
RADIOACTIVE WASTE ISOLATION IN SALT: PEER REVIEW OF THE OFFICE OF NUCLEAR WASTE ISOLATION'S REPORT ON THE ORGANIC GEOCHEMISTRY OF DEEP GROUNDWATERS FROM THE PALO DURO BASIN, TEXAS
D. F. Fenster, D. G. Brookins, W. Harrison, M. G. Seitz, A. Lerman, and V. C. Stamoudis Aug. 1984 31 p refs
(Contract W-31-109-eng-38)
(DE85-001439; ANL/EES-TM-259) Avail: NTIS HC A03/MF A01

The Office of Nuclear Waste Isolation's (ONWI's) final report entitled the organic geochemistry of deep ground waters from the Palo Duro Basin, Texas, dated September 1983, is reviewed. Recommendations are made for improving the ONWI report. The main recommendation is to make the text consistent with the title and with the objective of the project as stated in the introduction. Three alternatives are suggested to accomplish this. DOE

74 OPTICS

Includes light phenomena.

N85-19812*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODULATION TRANSFER FUNCTION (MTF) MEASUREMENT TECHNIQUES FOR LENSES AND LINEAR DETECTOR ARRAYS
James J. Schnabel, Jr., James E. Kaishoven, Jr., and David Tom Oct. 1984 19 p
(NASA-TM-86168; NAS 1.15:86168) Avail: NTIS HC A02/MF A01 CSCL 20F

Application is the determination of the Modulation Transfer Function (MTF) for linear detector arrays. A system set up requires knowledge of the MTF of the imaging lens. Procedure for this measurement is described for standard optical lab equipment. Given this information, various possible approaches to MTF measurement for linear arrays is described. The knife edge method is then described in detail. Author

N85-19813# Naval Research Lab., Washington, D. C.
RAMAN SIDESCATTERING IN LASER-PRODUCED PLASMAS
C. R. Menyuk and N. M. El-Siragy 27 Dec. 1984 19 p
(AD-A148905; NRL-MR-5483) Avail: NTIS HC A02/MF A01 CSCL 20/6

The theory of the Raman sidescattering instability in an inhomogeneous plasma is revisited. The growth rate is found from the eigenvalue of a second order ordinary differential equation in the Fourier domain. Under certain, rather easily satisfied constraints, the normalized growth rate depends on a single parameter involving laser strength, gradient scale length and resonant density. GRA

N85-19814# Naval Research Lab., Washington, D. C. Advanced Concepts Branch.
ELIMINATION OF SENSOR ARTIFACTS FROM INFRARED DATA Interim Report
Richard Steinberg 11 Dec. 1984 21 p
(AD-A149048; NRL-8861) Avail: NTIS HC A02/MF A01 CSCL 17/5

The objective of the Navy Background Measurements and Analysis Program (BMAP) is to satisfy the data requirements for design of surface, and air-based infrared (IR) search and track devices. The IR backgrounds data are acquired with a sensor

that has high spatial resolution, high sensitivity, and simultaneous 4 to 5 micron/8 to 11 micron capability. Laboratory test show that the 8 to 11 micron detector array has an undesired ground resistance that introduces weak electrical resistive coupling among the detector channels, giving rise to spatial defects in the long-wave data. Techniques are developed for inverting the focal plane resistive network, effectively decoupling the detector channels and eliminating the spatial artifacts, without smoothing the data or degrading noise performance. GRA

N85-19815# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
ONE-DIMENSIONAL PROCESSING FOR ADAPTIVE IMAGE RESTORATION M.S. Thesis
P. Chan Jun. 1984 100 p
(Contract N00014-81-K-0742; Grant NSF ECS-80-07102)
(AD-A149314; TR-501) Avail: NTIS HC A05/MF A01 CSCL 20/6

A one-dimensional (1-D) approach to the problem of adaptive image restoration is presented. In this approach, we use a cascade of four 1-D adaptive filters oriented in the four major correlation directions of the image, with each filter treating the image as a 1-D signal. The objective of this 1-D approach is to improve the performance of the more general two-dimensional (2-D) approach. This differs considerably from previous 1-D approaches, the objectives of which have typically been to approximate a more general 2-D approach for computational reasons and not to improve its performance. The main advantage of this new 1-D approach is its capability to preserve edges in the image while removing noise in all regions of the image, including the edge regions. To illustrate this point, the approach is applied to existing 2-D image restoration algorithms. Experimental results with images degraded by additive white noise at various SNRs (signal to noise ratios) are presented. Further examples illustrate the application of 1-D restoration techniques based on this approach to images degraded by blurring and additive white noise and images degraded by multiplicative noise. Another example shows its usefulness in the reduction of quantization noise in pulse code modulation image coding. GRA

N85-19816# Science Applications International Corp., McLean, Va.
IMAGE UNDERSTANDING: PROCEEDINGS OF THE 15TH WORKSHOP Annual Technical Report, Jun. 1983 - Oct. 1984
L. S. Baumann, ed. Oct. 1984 447 p Workshop held in New Orleans, 3-4 Oct. 1984
(Contract MDA903-82-C-0160; DARPA Order 3456)
(AD-A149496; SAIC-84/1726) Avail: NTIS HC A19/MF A01 CSCL 20/6

This document contains the technical papers and outlines of semi-annual progress reports presented by the research activities in Image Understanding, sponsored by the Information Processing Techniques Office; Defense Advanced Research Projects Agency. The papers were presented at a workshop conducted on 3-4 October 1984, in New Orleans, Louisiana. Author (GRA)

N85-19817# Air Force Armament Lab., Eglin AFB, Fla.
OPTICAL IMPLEMENTATION OF THE SYNTHETIC DISCRIMINANT FUNCTION
S. Butler and J. Riggins 21 Oct. 1984 9 p
(AF Proj. 2305)
(AD-A149562; AFATL-TR-84-103) Avail: NTIS HC A02/MF A01 CSCL 20/6

Much attention is focused on the use of coherent optical pattern recognition (OPR) using matched spatial filters for robotics and intelligent systems. The OPR problem consists of three aspects -- information input, information processing, and information output. This paper discusses the information processing aspect which consists of choosing a filter to provide robust correlation with high efficiency. The filter should ideally be invariant to image shift, rotation and scale, provide a reasonable signal-to-noise (S/N) ratio and allow high throughput efficiency. The physical implementation of a spatial matched filter involves many choices. These include the use of conventional holograms or computer-generated holograms (CGH) and utilizing absorption or phase materials. Conventional holograms inherently modify the reference image by non-uniform emphasis of spatial frequencies. Proper use of film nonlinearity provides improved filter performance by emphasizing frequency ranges crucial to target discrimination. In the case of a CGH, the emphasis of the reference magnitude and phase can be controlled independently of the continuous tone or binary writing processes. This paper describes computer simulation and optical implementation of a geometrical shape and a Synthetic Discriminant Function (SDF) matched filter. The authors chose the binary Allebach-Keegan (AK) CGH algorithm to produce actual filters. The performances of these filters were measured to verify the simulation results. This paper provides a brief summary of the matched filter theory, the SDF, CGH algorithms, Phase-Only-Filtering, simulation procedures, and results. GRA

N85-19818# Department of the Air Force, Washington, D.C.
OPTICAL MARK READER Patent Application
B. R. Archambeault, inventor (to Air Force) Filed 18 Oct. 1984 35 p
(AD-D011462; US-Patent-Appl-SN-662476) Avail: NTIS HC A03/MF A01 CSCL 17/8

The reading of the presence or absence of a pencil or similar mark at various locations on a sheet of paper is accomplished by an optical Mark-Reader comprised of a completely solid state sensing mechanism with no moving parts. The Optical Mark Reader (OMR) contains a matrix of light sensitive transistors with their geometry and logic circuits capable of being tailored for a plurality of answer sheets. The internal logic circuits enable certain sections of the page to be read, generate a delay time while the data is being gathered, tell the host computer when the data is complete, and resets the OMR operator control system for successive page readings. Finally, the internal logic circuits and output bus of the OMR takes the raw data from the answer sheets and presents information on an output bus in a format allowing any computer (even a micro-computer) to be the host computer. GRA

N85-19819# Department of the Air Force, Washington, D.C.
FINE FIGURING ACTUATOR Patent Application
J. W. Pepi, inventor (to Air Force) Filed 17 Oct. 1984 13 p
(AD-D011476; US-Patent-Appl-SN-661833) Avail: NTIS HC A02/MF A01 CSCL 20/6

A novel mirror structure and actuator for precision control of the contour of a mirrored surface is described which comprises a movable control member for contacting the mirror faceplate, and a position controller, which may be in the form of an electrically controlled magnet and coil assembly, operatively interconnecting the control member and a rigid support for the mirror structure. A position sensor operatively interconnects the control member and the mirror support to sense the position of the control member and to provide a corresponding output signal. Programmable information processing electronics, responsive to the output signal of the position sensor, provide an input signal to the position controller to move the control member against the faceplate whereby the shape of the faceplate may be controlled according to a preprogrammed scheme applied to the electronics. GRA

N85-19820# Department of the Navy, Washington, D. C.
TRIPLE MATRIX PRODUCT OPTICAL PROCESSORS USING COMBINED TIME-AND-SPACE INTEGRATION Patent Application
R. A. Athale and J. N. Lee, inventors (to Navy) Filed 10 Oct. 1984 31 p
(AD-D011483; US-Patent-Appl-SN-654926) Avail: NTIS HC A03/MF A01 CSCL 20/6

This invention is directed to optical matrix multiplication, and more particularly, to the high-speed matrix multiplication of three matrices. The multiplication of three matrices is often encountered in problems involving the computation of singular values of matrices or involving orthogonal transformation of matrices. GRA

N85-19821# Los Alamos Scientific Lab., N. Mex. Theoretical Div.

IMAGING THROUGH A MULTIPLE SCATTERING MEDIUM
A. Zardecki, S. A. W. Gerstl, and J. F. Embury (Chemical Research and Development Center, Aberdeen Proving Ground, Md.) 1984 5 p refs Presented at the CRDC Scientific Conf. on Obscuration and Aerosol Res., Baltimore, 25-29 Jun. 1984
(Contract W-7405-eng-36)
(DE85-002051; LA-UR-84-3057; CONF-8406152-2) Avail: NTIS HC A02/MF A01

The existing theory of imaging through an aerosol medium, based on the small-angle approximation to radiative transfer, is extended to the general case of multiple scattering with an arbitrary degree of anisotropy. By applying the discrete-ordinates, finite-element radiation transport code TWOTRAN, the modulation transfer function for a medium characterized by optical depth, single scattering albedo, and a symmetry parameter is computered. An extended version of this investigation will appear in a 1984 issue of Applied Optics. DOE

N85-19822# Brookhaven National Lab., Upton, N. Y.
CONSTRUCTION TOLERANCES FOR LOW LOSS, DIELECTRIC COATED, METALLIC WAVEGUIDE FOR TRANSMISSION OPTICAL RADIATION
J. Sandweiss (Yale Univ.) Aug. 1984 20 p refs
(Contract DE-AC02-76CH-00016)
(DE85-004056; BNL-35444) Avail: NTIS HC A02/MF A01

The transmission of radiation, in a specific mode of interest for the IFELA, past a symmetric step in dielectric coating thickness was calculated. The result shows that the transmission loss depends on the quantity (s/D)(2) and vanishes to first order in the ratio of the steps to the guide aperture D. With the reasonable assumption that his feature holds for all forms of surface imperfections, the attenuation length due to imperfections was estimated. It is found that rms surface roughness of approx. 0.1 micron leads to attenuation lengths of 25 km or greater. DOE

N85-19311# Joint Publications Research Service, Arlington, Va.
NTT (NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORPORATION) DEVELOPS NEW OPTICAL FIBER
In its Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-85-002) 24 Jan. 1985 p 9 Repr. from Kyodo (Tokyo), no. 0758 GMT, 7 Nov. 1984 (For primary document see N85-19309 10-32)
Avail: NTIS HC A04/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-19823*# TRW Space Technology Labs., Redondo Beach, Calif. Applied Technology Div.
RESEARCH STUDY OF SPACE PLASMA BOUNDARY PROCESSES Final Report, 1 Oct. 1983 - 30 Sep. 1984
E. W. Greenstadt and W. W. L. Taylor 23 Oct. 1984 45 p refs
(Contract NASw-3836)
(NASA-CR-174351; NAS 1.26:174351; TRW-43836-6002-UT-00) Avail: NTIS HC A03/MF A01 CSCL 20I

Representation of the Earth's bow shock and magnetopause and their geometrically determined macrostructure was investigated. Computer graphic depictions of the global distributions of bow shock structures and elementary animation of the dynamics of those distributions in the changing solar wind were developed. The shock-foreshock boundary and subcritical bow shocks as observed by ISEE 1 and 2 are discussed. R.S.F.

N85-19824# Naval Research Lab., Washington, D. C.
HYDRODYNAMIC RESPONSE OF A RADIATING Al PLASMA EXCITED BY A PROTON BEAM
J. E. Rogerson, R. W. Clark, and J. Davis 20 Dec. 1984 55 p
(AD-A148904; NRL-MR-5482) Avail: NTIS HC A04/MF A01 CSCL 20/8

A fully self-consistent one-dimensional ion beam-slab interaction model has been developed which describes the slowing down of the beam, the hydrodynamic response and ionization dynamics of the slab, and detailed radiation emission and transport. An extensive atomic level structure with collisional radiative ionization dynamics is employed in conjunction with a hybrid radiation transport scheme which consists of a multifrequency formalism for continuum transport and a probabilistic treatment for line transport. It is found that beam deposition and slab response depend strongly on radiation transport within the slab. Temperature and density profiles and emission spectra are presented. GRA

N85-19825# Stuttgart Univ. (West Germany).
ANALYSIS OF THE DISSIPATION MECHANISM WITHIN AN INSTATIONARY CATHODE SPOT OF METAL VAPOR ARCS Annual Report. 1 Aug. 1983 - 31 Jul. 1984
H. O. Schrade, H. L. Kurtz, M. Auweter-Kurtz, and M. Kirschner 17 Aug. 1984 47 p
(Grant AF-AFOSR-0298-82)
(AD-A149258; IRA-84-IB-6; AFOSR-84-1166TR) Avail: NTIS HC A03/MF A01 CSCL 20/3

This paper deals with the dissipation mechanism of microspots on low pressure arc cathodes. Based on a new MPD stability theory and on an experimentally found empirical relation between spot current and crater radius on pure copper and molybdenum cathodes, the time behavior of pressure and temperature within the spot and the appertaining voltage drop have been calculated. Emphasis has been placed on finding an analytical solution for the time dependent heat flux into the hemispherical crater surface as a function of the expansion of the spot. GRA

N85-19826# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.
GENERATION OF ALFVEN WAVES DUE TO THERMAL MODULATION OF THE ELECTRICAL CONDUCTIVITY
M. M. Shoucri, G. J. Morales, and J. E. Maggs Nov. 1984 34 p
(Contract N00014-76-C-0476)
(AD-A149389; AD-F300533; PPG-830) Avail: NTIS HC A03/MF A01 CSCL 20/9

An analytic study is made of the effects produced by a localized modulation of the electrical conductivity of a magnetized plasma carrying a field aligned current. The modulation is assumed to be caused by a heating source external to the plasma. The formulation used is applicable to modulation frequencies, omega, below the ion cyclotron frequency omega sub ci, and permits the calculation of the radiation pattern which contains shear as well as compressional Alfven modes, and near fields. For omega/omega sub ci $<<1$, the radiation appears primarily in the form of a highly collimated shear mode travelling along the field lines passing through the spot where the modulation occurs. GRA

N85-19827# Oak Ridge National Lab., Tenn.
FAR-INFRARED INTERFEROMETRY/POLARIMETRY ON THE ISX-B TOKAMAK
D. P. Hutchinson, C. H. Ma, P. A. Staats, and K. L. VanderSluis 1984 3 p refs Presented at the 3rd Intern. Conf. on Infrared Phys. ETH, Zurich, 23-27 July 1984
(Contracts W-7405-eng-26; DE-AC05-84OR-21400)
(DE84-015401; CONF-840725-5) Avail: NTIS HC A02/MF A01

Theoretical analyses have shown that the current density distribution in a Tokamak plasma can be obtained indirectly by the measurement fo the polidal magnetic field created by the current flowing in the plasma discharge. The distribution of this field may be determined by projecting linearly polarized far-infrared (FIR) laser beams through the plasma and measuring the Faraday rotation of the polarization. Since the rotation angle of the polarization vector is proportional to the line integral of electron density time the poloidal magnetic field along the path, the electron density profile must also be measured simultaneously in order to unfold the current distribution. The amount of Faraday rotation expected in a typical plasma experiment is calculated to be on the order of 5 to 10 degrees. A multichord modulated FIR polarimeter/interferometer was constructed that measures both the

phase delay of four laser beams passing through a plasma discharge and the instantaneous polarization of these same beams. The phase shift of each of the beams is directly proportional to the line-averaged electron density and the polarization rotation is directly proportional to the line-averaged density times poloidal field. DOE

N85-19828# Los Alamos Scientific Lab., N. Mex. Physics Div.
APPLICATION OF LAYERED SYNTHETIC MICROSTRUCTURES TO HIGH TEMPERATURE PLASMA DIAGNOSTICS
Robert H. Day and Troy W. Barbee (Stanford Univ.) 1984 29 p refs Presented at the 5th APS Topical Conf. on High Temperature Plasma Diagnostics, Tahoe City, Calif., 16-20 Sep. 1984
(Contract W-7405-eng-36)
(DE85-002035; LA-UR-84-2943; CONF-840922-6) Avail: NTIS HC A03/MF A01

Layered Synthetic Microstructures, LSM's, are a new type of manmade X-ray diffracting element which can be applied to a broad variety of diagnostic applications. The ability to use the synthesis process to engineer the properties of the LSM allow the designer of X-ray diagnostics to construct many novel instruments. The state-of-the-art in LSM fabrication is reviewed, and some unique spectrometers are described that have been designed and fielded to provide what is unachievable with conventional designs. An experiment is underway to understand the properties of LSM's intense heat loads. DOE

N85-19829# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.
MAGNETIC FUSION ENERGY PLASMA INTERACTIVE AND HIGH HEAT FLUX COMPONENTS. VOLUME 3: STRATEGY FOR INTERNATIONAL COLLABORATIONS IN THE AREAS OF PLASMA MATERIALS INTERACTIONS AND HIGH HEAT FLUX MATERIALS AND COMPONENTS DEVELOPMENT
W. B. Gauster, W. Bauer, J. B. Roberto, and D. E. Post Jan. 1984 23 p ref
(DE85-001145; UCLA/PPG-816) Avail: NTIS HC A02/MF A01

Opportunities were assessed for international research collaboration in the specific areas of plasma materials interaction, high heat flux materials, and components development. Key technical issues are summarized along with the US programs to address them. Present collaborations and potential opportunities in foreign laboratories are listed. R.S.F.

N85-19830# Rochester Univ., N. Y. Lab. for Laser Energetics.
PARAMETRIC PROCESSES IN UNDERDENSE UV LASER-PRODUCED PLASMAS
K. Tanaka, B. Boswell, R. S. Craxton, L. M. Goldman, W. Seka, R. W. Short, J. M. Soures, R. Bahr, and F. Guglielmi 25 Oct. 1984 15 p Presented at the Meeting of the Plasma Physics Division of the American Physical Society, Boston, 27 Oct. 1984
(Contract DE-AC08-80DP-40124)
(DE85-002812; DOE/DP-40124/62; CONF-841010-7) Avail: NTIS HC A02/MF A01

Studies of UV laser plasma interactions in underrdense plasmas, using a single beam (lambda sub L) = 351-nm, E (sub L) < 50 J, I (sub L) is less than or equal to (10 to the 15th power W/sq cm) incident on foam targets are described. Average densities of these targets were 2n (sub c)/3, n (sub c)/3 and n (sub c)/10 (n (sub c): critical density). An extraordinary correlation between the Brillouin backscatter signal and the 3(OMEGA)/2 emission as a function of irradiation intensity was observed, indicative of possible coupling between these parametric processes. DOE

N85-19831# Rochester Univ., N. Y. Lab. for Laser Energetics.
NONLINEAR SATURATION OF STIMULATED RAMAN SCATTERING IN COLLISIONAL HOMOGENEOUS PLASMA
C. J. McKinstrie and A. Simon 1984 23 p ref Presented at the Meeting of the Plasma Physics Div. of the American Physical Society, Boston, 27 Oct. 1984
(Contract DE-AC08-80DP-40124)
(DE85-002814; DOE/DP-40124/54; CONF-841010-6) Avail: NTIS HC A02/MF A01

A previous threshold calculation of nonlinear saturation of the SRS instability in collisional homogeneous plasma is extended using multiple time scale analysis. This purely temporal problem, with a ubiquitous driver and arbitrary damping for each wave, is solved for incident pump amplitudes exceeding threshold by the factor m (where m can be much larger than unity). New expressions are obtained for the saturated amplitude of each wave. The reflection coefficient is (OMEGA sub 2/OMEGA sub 1)(3) (1-1/m) where OMEGA sub 1 and OMEGA sub 2 are the frequencies of the incident and scattered e.m. waves. A formula which includes the effect of mismatch is also given. With only one wave damped the reflection coefficient is (OMEGA sub 2/OMEGA sub 1). This difference can be understood by a simple energy argument. Author

N85-19832# California Univ., Livermore. Lawrence Livermore Lab.
SMALL, OCTOPOLE-STABILIZED TANDEM MIRROR REACTOR
R. S. Devoto, D. E. Baldwin, B. G. Logan, G. W. Hamilton, and B. W. Johnston 3 Oct. 1984 50 p refs
(Contract W-7405-eng-48)
(DE85-002144; UCID-20157) Avail: NTIS HC A03/MF A01

It is shown that the use of octopole stabilization in a tandem mirror allows a large reduction in end-cell length. A novel feature of the method proposed is the placement of the minimum IBI region considerably off axis, thus rendering the core plasma more axisymmetric. The region from the core to the field minimum is bridged by a mirror-confined, hot-electron mantle. Low beta, ideal magnetohydrodynamic stability, as evaluated with the interchange criterion, yields an upper limit to the required mantle peak beta of 78% for a center-cell peak beta of 75% and barrier peak beta of 30%. Estimates for the worst type of classical radial diffusion - with stochastic displacements per bounce - show that such radial losses are negligible for this configuration. First estimates of power balance indicate Q approx. 10 for a reactor producing 500 MW of fusion power and Q approx. 25 for one producing 1000 MW, using conservative assumptions regarding mantle beta requirements and synchrotron radiation losses. DOE

N85-19833# Rochester Univ., N. Y. Lab. for Laser Energetics.
ION VELOCITY DISTRIBUTIONS FROM SPHERICAL 1054 nm AND 351 nm LASER PLASMAS
B. Boswell, T. Boehly, J. Delettrez, L. M. Goldman, M. C. Richardson, and S. Sarraf 1984 31 p Presented at the Meeting of Plasma Phys. Div. of the Am. Phys. Soc., Boston, 27 Oct. 1984
(Contract DE-AC08-80DP-40124)
(DE85-002816; DOE/DP-40124/49; CONF-841010-3) Avail: NTIS HC A03/MF A01

The observation of ion velocity distributions from spherically illuminated targets are reported, and the results compared to the predictions of analytical ablation models and the 1-D hydrodynamic code LILAC. Low-Z spherical targets were irradiated at 351 nm and 1054 nm by the OMEGA laser system at intensities less than or equal to 10(15) W/cm(2). The uv pulses were from 6 and 12 beams, 600 ps duration, and the ir from 24 beams, 1 ns duration. Velocity distributions were taken with Faraday cups and a Thomson parabola. Peak velocities for uv show agreement with the exhaust velocities predicted by the spherical steady-state ablation model, and agree in shape with LILAC simulations, while ir velocity distributions are more characteristic of isothermal expansion. DOE

N85-19834# Texas Univ., Austin. Center for Fusion Engineering.
SPACE-TIME STATISTICS OF THE TURBULENCE IN A TOKAMAK EDGE PLASMA
Scott J. Levinson, John M. Beall, Edward J. Powers, Jr., and Roger D. Bengtson Jul. 1984 38 p refs
(Contract DE-AS05-77ET-53042)
(DE85-002667; DOE/ET-53042/T1; Working-Paper-1) Avail: NTIS HC A03/MF A01

The results of a study of the statistical space-time properties of the turbulence observed in the edge region of the PRETEXT Tokamak are reported. A local estimate of the wavenumber-frequency spectra S(k,omega) for poloidal (k sub y) and toroidal (k sub z) wavenumbers is determined for the range .5/cm < k < 7.5/cm for both potential and density fluctuations obtained from spatially fixed Langmuir probe pairs. The S (k sub y/, omega) spectra are dominated by low frequencies and small wavenumbers and appear broadened about an approximately linear statistical dispersion relation, bar-k (omega). The broadening is characterized by a spectral width sigma sub k (omega) which is of the order of bar-k(omega). The turbulence appears to propagate poloidally with an apparent mean phase velocity of 100,000 to 200,000 cm/s in the ion diamagnetic drift direction. Measurements of the fluctuation-induced particle transport reveal the particle flux to be outward and resulting primarily from the low frequency, long wavelength components of the turbulence. R.S.F.

N85-19835# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.

FINITE-(BETA) OPTIMIZATION OF TANDEM MIRRORS

D. A. Dippolito, G. L. Francis, and J. R. Myra 1984 15 p refs
(Contract DE-AC03-76ET-53057)
(DE85-002658; SAIC-84/1341-PRI-82) Avail: NTIS HC A02/MF A01

A previously developed numerical algorithm for optimizing tandem mirror coil design with respect to plasma stability and radial confinement is extended to include plasma diamagnetic effects on the magnetic field. Within the context of an approximate equilibrium model, it is shown that nearly omnigenous (transport free) tandem mirror designs with good finite-beta stability can be obtained by this techniques. DOE

N85-19836# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.

ENTROP PRODUCTION DETERMINATION OF THE AMBIPOLAR SOLUTION NEAREST EQUILIBRIUM

Peter J. Catto and J. R. Myra Oct. 1984 22 p refs
(Contract DE-AC03-76ET-53057)
(DE85-003049; SAIC-84/1787-PRI-84) Avail: NTIS HC A02/MF A01

A general derivation of the steady state entropy production equation is presented for a confined plasma which loses particles and energy via radial transport and, perhaps, end loss. The resulting equation is employed to determine which root or solution is closest to thermodynamic equilibrium when more than one self-consistent or ambipolar solution is possible. DOE

N85-19837# Rochester Univ., N. Y. Lab. for Laser Energetics.

NONLINEAR SATURATION OF STIMULATED RAMAN SCATTERING IN HOMOGENEOUS PLASMA

C. J. McKinstrie, A. Simon, and E. A. Williams Apr. 1984 30 p refs
(DE85-003120; DOE/DP-40124/69; Lab-Rept-155) Avail: NTIS HC A03/MF A01

Nonlinear saturation of the stimulated Raman scattering instability is considered in an infinite homogeneous plasma. The incident wave amplitude exceeds its threshold value by the fractional amount Delta) (,, 1). A single backscattered electromagnetic wave and a single plasma wave grow until time-asymptotic saturation occurs. The squared amplitude and nonlinear frequency shift of each wave are determined by secular-free perturbation theory and are proportional to Delta. The saturation mechanism is identified and the reflection coefficient determined. Both saturation amplitudes are shown to be stable to small deviations from their time-asymptotic values. DOE

N85-19838# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

MODELING THERMAL PLASMA MATERIAL PROCESSING EXPERIMENTS

D. J. Varacalle, Jr., L. S. Richardson, and M. E. McIlwain 1984 13 p refs Presented at Symp. on the Sci. Basis for Nucl. Waste Manage., Boston, 26 Nov. 1984
(Contract DE-AC07-76ID-01570)
(DE85-001551; EGG-M-14684; CONF-841157-19) Avail: NTIS HC A02/MF A01

Spatial distributions of plasma variables (concentration, temperature, and velocity) were calculated for alumina and carbon species injected in an argon thermal plasma. The plasma behavior was modeled from arc initiation through free plume expansion by combining a plasma code with a plume code. The model assumed a direct current, constrictor type, arc heater. The feasibility of using thermal plasmas for ore reduction was analyzed. The process investigated the carbothermic reduction of alumina. DOE

N85-19839# Texas Univ., Austin. Inst. for Fusion Studies.

ROLE OF MULTIPLE HELICITY NONLINEAR INTERACTION OF TEARING MODES IN DYNAMO AND ANOMALOUS THERMAL TRANSPORT IN THE REVERSED PITCH FIELD

Z. G. An (Southwestern Inst. of Physics, China), P. H. Diamond, R. D. Hazeltine, J. N. Leboeuf, M. N. Rosenbluth, R. D. Sydora, T. Tajima, B. A. Carreras, D. Garcia, T. O. Hender et al Oct. 1984 24 p refs Presented at the 10th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., London, 12-19 Sep. 1984 Prepared in cooperation with Oak Ridge National Lab., Tenn. and New York Univ., New York City
(Contracts DE-AC05-84OR-21400; DE-AC02-76ER-03077; Grant DE-FG05-80ET-53088)
(DE85-002176; DOE/ET-53088/159; CONF-840910-19) Avail: NTIS HC A02/MF A01

A theory of magnetic fluctuation dynamics, the dynamo mechanism, and anomalous thermal transport in the reversed field pinch is presented. Nonlinear generation of and coupling to m greater than or equal to 2 m codes is advanced as an m-1 tearing modes sustain the magnetic configuration and stabilize themselves by lowering the safety factor on axis (g(0)) are elucidated. The nonlinear dynamics of resistive interchange modes are discussed. Stochastic magnetic field transport arguments are used to estimate anomalous thermal conductivity and confinement scalings. DOE

N85-19840# Department of Energy, Washington, D. C. Office of Energy Research.

THE 1984 REVIEW OF THE APPLIED PLASMA PHYSICS PROGRAM

Sep. 1984 104 p refs
(DE85-002136; DOE/ER-0063) Avail: NTIS HC A06/MF A01

The present and planned programs of the Division of Applied Plasma Physics (APP), Office of Fusion Energy, are described. The major activities of the division include fusion theory, experimental plasma research, advanced fusion concepts, and the magnetic fusion energy computer network. The planned APP program is consistent with the recently issued Comprehensive Program Management Plan for Magnetic Fusion Energy, which describes the overall objectives and strategy for the development of fusion energy. DOE

N85-19841# Florida Univ., Gainesville. Dept. of Physics.

X-RAY LINE BROADENING OF A DIAGNOSTIC IN LASER PRODUCED PLASMA Final Technical Report, 4 Aug. 1982 - 3 Aug. 1983

C. F. Hooper, Jr. Jun. 1984 6 p refs
(Contract DE-AS08-81DP-40159)
(DE85-001179; DOE/DP-40159/2) Avail: NTIS HC A02/MF A01

The theoretical line broadening research carried out under this contract involved two main areas: calculation of: (1) widths, shifts, and asymmetries of Stark broadened Lyman series lines from high-Z hydrogenic radiators on dense plasmas; and (2) opacity effects on hydrogenic and helium-like lines and satellite diagnostics. DOE

N85-19842# Los Alamos Scientific Lab., N. Mex.

FRC TRANSLATION DYNAMICS AND PLASMA CONFINEMENT PROPERTIES IN FRX-C/T

D. J. Rej, M. Tuszewski, W. T. Armstrong, R. E. Chrien, P. I. Klinger, K. F. McKenna, R. E. Siemon, E. G. Sherwood, and R. D. Milroy (Mathematical Sciences Northwest, Inc., Bellevue, Wash.) 1984 12 p refs Presented at the Japan/US Joint Symp. on Compact Toroid Res., Hiroshima, 13-15 Nov. 1984
(Contract W-7405-eng-36)
(DE85-002386; LA-UR-84-3289; CONF-8411111-2) Avail: NTIS HC A02/MF A01

In the FRX-C/T experiment field-reversed configuration (FRC) plasmas are translated over 16 meters without inducing instabilities or enhanced transport. The plasmas are formed in either a puff or static D2 fill and they are accelerated to axial speeds of up to the ion thermal velocity. The observed acceleration dynamics agree with 2-D MHD simulations. When translated into reduced external magnetic fields, FRCs are observed to accelerate, expand, and cool in approximate agreement with adiabatic theory. The plasmas reflect from an external mirror with negligible loss in thermal energy, particle inventory, and poloidal magnetic flux. After each reflection the axial kinetic energy is reduced by approximately 50%. Because of this reduction, FRCs are readily trapped without the need of pulsed gate magnet coils. Translation has also allowed the scaling of FRC confinement over an extended parameter space with plasma dimensions, temperatures, and densities varying by factors of 2 to 4. R.S.F.

N85-19843# Los Alamos Scientific Lab., N. Mex.
RESISTIVE EVOLUTION OF GENERAL PLASMA CONFIGURATION
G. Miller Sep. 1984 29 p refs
(Contract W-7405-eng-36)
(DE85-002340; LA-10178-MS) Avail: NTIS HC A03/MF A01

The resistive evolution through equilibrium states of general plasma configurations with closed magnetic field lines is described. Cases where the magnetic field forms magnetic surfaces and where the magnetic field is ergodic are treated. In the former case, a simple equation for the rate of change of rotational transform at fixed values of toroidal flux is obtained, as is already known. In the latter case the evolution of the equilibrium is naturally described in terms of the magnetic helicity by use of the formalism of relaxed states. The equation for rate of change of magnetic helicity is shown to be a general law of resistive evolution, implying the former equation for rotational transform in the case of magnetic surfaces. In principle, the resistive evolution model provides a complete description of global long time scale plasma behavior in the limit where the plasma density vanishes. In this limit, the magnetohydrodhnamic description of a plasma is not practical because of the vanishing of the inertial time scale. DOE

N85-19844# California Univ., Livermore. Lawrence Livermore Lab.
THERMAL BARRIER CONFINEMENT EXPERIMENTS IN TMX-U TANDEM MIRROR, REVISION 1
T. C. Simonen, S. L. Allen, D. E. Baldwin, T. A. Casper, J. F. Clauser, F. H. Coensgen, R. H. Cohen, D. L. Correll, W. F. Cummins, and C. C. Damm 26 Jul. 1984 14 p refs Presented at the 10th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., London, 12 Sep. 1984
(Contract W-7405-eng-48)
(DE84-017029; UCRL-90396-Rev-1; CONF-840910-8-Rev-1) Avail: NTIS HC A02/MF A01

In recent experiments on the TMX-U thermal barrier device, end plugging of axial ion losses up to a central cell density of n sub c = 6 x 10 to the 12th power/cu cm was achieved. During lower density experiments, the axial potential profile characteristic of a thermal barrier was measured and an ion confining potential greater than 1.5 kV and a potential depression of 0.45 kV in the barrier region were found. The average beta of hot end plug electrons has reached 15% and of hot central cell ions has reached 6%. In addition, deuterium ions in the central cell were heated with ICRF to an average perpendicular energy of 2 keV. During strong end plugging at low density, the axial ion confinement time tau sub parallel to reached 50 to 100 ms while the nonambiopolar radial ion confinement time tau sub perpendicular to was 14 ms - independent of end plugging. Electrically floating end walls doubled the radial ion confinement time. At higher densities and lower potentials, tau sub parallel to was 6 to 12 ms and tau sub perpendicular to exceeded 100 ms. DOE

N85-19845# Oak Ridge National Lab., Tenn. Fusion Energy Div.
ELECTRON BOUNCE RESONANCE HEATING IN A BUMPY CYLINDER
G. L. Chen Oct. 1984 34 p refs
(Contract DE-AC05-840R-21400)
(DE85-001732; ORNL/TM-9210) Avail: NTIS HC A03/MF A01

In bumpy cylinder geometry, the electrons are classified into trapped and passing particles. The interaction between a wave near the electron bounce frequency and the electrons is studied both numerically and analytically for the appropriate parameters of ELMO Bumpy Torus-Scale (EBT-S). Coupling of the waves to the electron bounce motion parallel to the magnetic field can lead to heating of those electrons near the passing/trapped boundary in velocity space. The stochastic threshold condition is eE0k0/m(LC OMEGA)/sub b/(2) approx. = 0.1. For this mechanism, it is found that the wave energy density required to induce stochastic heating in EBT by rf (in the frequency range of ion cyclotron resonance heating (ICRH) is about an order of magnitude more than that estimated on the basis of cold plasma wave theory. It is hypothesized that this discrepancy would disappear when the thermal correction to the wave propagation and the effects of collisions and toroidicity are included. We also suggest that the bounce resonance can enhance the electron cyclotron resonance heating (ECRH) efficiency in an EBT-like heating scheme. Author

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-19846 Department of the Army, Washington, D. C.
LIQUID-PHASE EPITAXIAL GROWTH OF CdTe ON HgCdTe Patent
C. C. Wang and M. Chu, inventors (to Army) Issued 2 Nov. 1982 6 p
(AD-D011482; US-Patent-4,357,620; US-Patent-Appl-SN-207863; US-Patent-Class-357-16) Avail: US Patent and Trademark Office CSCL 20/2

A HgCdTe monolithic focal plane is developed by first growing by liquid-phase epitaxial growth a HgCdTe epilayer with a desired Cd composition on a CdTe substrate, and then by growing a CdTe epilayer on the HgCdTe epilayer. In the resulting structure the HgCdTe layer is designed to sense IR radiation, and the CdTe substrate and the CdTe epilayer are effective in their function as radiation transmitter and as a signal processor. The resulting structure is a heterojunction structure which detects low infrared (IR) energy in the narrow gap semiconductor and transfer the resulting charges to the wider gap semiconductor for signal processing. GRA

N85-19847*# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Electrical Engineering.
MATERIAL GROWTH AND CHARACTERIZATION FOR SOLID STATE DEVICES Annual Report, 1 Dec. 1983 - 30 Nov. 1984
E. K. Stefanakos, W. J. Collis, A. Abul-Fadl, and S. Iyer 30 Nov. 1984 22 p refs
(Grant NsG-1390)
(NASA-CR-174410; NAS 1.26:174410) Avail: NTIS HC A02/MF A01 CSCL 20L

Manganese was used as the dopant for p-type InGaAs layers grown on semi-insulating (Fe-doped) and n-type (Sn-doped) InP substrates. Optical, electrical (Hall) and SIMS measurements were used to characterize the layers. Mn-diffusion into the substrate (during the growth of In GaAs) was observed only when Fe-doped

substrates were used. Quaternary layers of two compositions corresponding to wavelengths (energy gaps) of approximated 1.52 micrometers were successfully grown at a constant temperature of 640 C and InP was grown in the temperature range of 640 C to 655 C. A study of the effect of pulses on the growth velocity of InP indicated no significant change as long as the average applied current was kept constant. A system for depositing films of Al2O3 by the pyrolysis of aluminum isopropoxide was designed and built. Deposited layers on Si were characterized with an ellipsometer and exhibited indices of refraction between 1.582 and 1.622 for films on the order of 3000 A thick. Undoped and p-type (Mn-doped) InGaAs epitaxial layers were also grown on Fe-doped InP substrates through windows in sputtered SiO2 (3200 A thick) layers. A.R.H.

N85-19848# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

METAL-NONMETAL TRANSITIONS IN N-DOPED MANY-VALLEY Si AND Ge

L. F. Perondi, A. FerreiradaSilva, and M. Fabbri Dec. 1984 17 p refs Submitted for publication

(INPE-3358-PRE/636) Avail: NTIS HC A02/MF A01

The critical concentration for the metal-nonmetal transition in n doped Si and Ge is calculated. The electronic system is described by a Hubbard tight binding model Hamiltonian. The disordered arrangement of the impurity atoms, the many valley nature of the host conduction band minima and the overlap corrections of the tight binding basis set are taken into account in the calculation. The results show fair agreement when compared to previous works and available experimental data. Author

N85-19849# California Univ., San Diego, La Jolla. Dept. of Electrical Engineering and Computer Sciences.

SURFACE AND INTERFACIAL PROPERTIES OF Ga(0.47) In(0.53)As ALLOYS Final Report, 1 Apr. 1983 - 30 May 1984

H. H. Wieder 25 Oct. 1984 30 p

(Contract N00019-83-C-0133)

(AD-A148891; AD-E850737) Avail: NTIS HC A03/MF A01 CSCL 20/12

Semiconducting Ga0.47In0.53As layers whose lattice constants match that of semi-insulating InP are potentially useful for discrete and integrated circuit microwave transistors and optoelectronic sensors compatible with the low loss, low dispersion spectral window of optical fibers. Their implementation requires evaluation, modelling and interpretation of the surface and interfacial properties of this ternary semiconducting compound in terms of fundamental physical parameters. We have investigated by means of field effect-controlled galvanomagnetic measurements the properties of the dielectric-semiconductor interface of (100)-oriented n-type Ga0.47In0.53As, compared these to theoretical calculations made for its free non-polar surface and to experimental measurements made by others on metal-insulator-semiconductor capacitors. Our results suggest that the equilibrium position of the surface Fermi level is not a strong function of crystallographic orientation and it is in good agreement with theoretical expectations, that the surface charge is slightly accumulated (0.1 eV from flatband) at room temperature and the surface potential can be displaced over most of the fundamental bandgap across flatband into accumulation and that, just as for silicon, the electron mobility decreases with increasing accumulation surface charge in accordance with preliminary theoretical arguments. GRA

N85-19850# IBM Watson Research Center, Yorktown Heights, N.Y.

TEMPERATURE-DEPENDENT SURFACE STATES AND TRANSITIONS OF Si(111)-7X7

J. E. Demuth, B. N. J. Persson, and A. J. Schell-Sorokin Sep. 1984 7 p

(Contract N00014-77-C-0366)

(AD-A149156; TR-23) Avail: NTIS HC A02/MF A01 CSCL 20/12

Ultraviolet photoemission and electron-energy-loss measurements of Si(111) - 7x7 between T = 15 and 300 K reveal significant temperature-dependent changes in the occupied surface states and their transitions which can be associated with electron-phonon coupling at the surface. Several new surface states and transitions are determined at low temperatures, including a highly localized (about 2-meV-wide), half-occupied state that resides within a 100-meV-wide surface-state band gap and determines the Fermi-level position. GRA

N85-19851# North Carolina State Univ., Raleigh. School of Engineering.

FUNDAMENTAL STUDIES OF GROWTH, DOPING AND TRANSFORMATION IN BETA SILICON CARBIDE Annual Technical Report, 1 Sep. 1983 - 31 Aug. 1984

R. F. Davis and H. H. Stadelmaier 31 Aug. 1984 57 p

(Contract N00014-79-C-0121; DA Proj. RR0-2102)

(AD-A149339; NCSU-243-043-005) Avail: NTIS HC A04/MF A01 CSCL 07/2

The dopants of B, P, N, and Al have been added to CVD grown beta-Silicon carbide thin films during growth and via ion implantation. A thermodynamic study has also been pursued to determine the gas phases and their partial pressures in equilibrium with the SiH4, C2H4, and H2 used to deposit the Silicon carbide. Annealing studies have shown that very high temperatures (1750 C) are necessary to activate the implanted species. Oxidation studies, plasma etching, electrical property measurements and device fabrication have also been conducted. Silicon carbide is the only compound species that exists in the solid state in the Si-C system and can occur in the cubic (C), hexagonal (H) or rhombohedral (R) structures. It is also classified as existing in the beta and alpha modifications. The beta, or cubic, form crystallizes in the zincblende or sphalerite structure; whereas, a large number (approximately 140) of the alpha occur in the hexagonal or rhombohedral forms known as polytypes. GRA

N85-19852# San Diego State Univ., Calif.

QUATERNARY NARROW-BAND SEMICONDUCTORS (HgTe)X (InSb)1-x FOR FAR-INFRARED DETECTORS Annual Interim Report, 1 Sep. 1983 - 31 Aug. 1984

L. I. Berger and S. W. Lin 31 Aug. 1984 77 p

(Contract N00014-83-K-0588)

(AD-A149350; AD-E751073) Avail: NTIS HC A05/MF A01 CSCL 17/5

This annual report includes a description of results from work on investigation of the quaternary system (HgTe) sub x (InSb) sub 1-x. The special furnaces for synthesis of the polycrystalline specimens in the system HgTe-InSb were made, the optimal ampules for synthesis and differential thermal analysis were designed, and the appropriate equipment for the specimen assessment was bought for adjusted. On the basis of the results of several first cycles of synthesis, the temperature-time regime for single-phase polycrystal synthesis, was developed. The single-phase ingots were synthesized with the vast range of composition, but the primary interest was concentrated upon synthesizing the single-phase specimens in the part of the concentration diagram which contains semiconductor alloys from 100 to 80 mole % InSb where the absorption edge range from 7 micrometer to 12 micrometer is expected. Synthesized specimens were used for microstructure analysis, differential thermal analysis (DTA) and X-ray analysis. Measurements of microhardness were used to proof the single-phase structure of the specimens. The alloy specimen assessment included also electrical, galvanomagnetic and optical measurements in the IR part of the spectrum. The sum of the results is used to develop the phase diagram of the semiconductor part of the (HgTe) Sub x (InSb) sub 1-x system, the diagrams composition-property for lattice parameters, concentration and mobility of the current carriers, and for the absorption edge in the infrared part of the spectrum. The main purpose of this project is the development of growth techniques for crystals and epitaxial layers of (HgTe) sub x (InSb) sub 1-x. GRA

N85-19853# Royal Signals and Radar Establishment, Malvern (England).

ROYAL SIGNALS AND RADAR ESTABLISHMENT

M. Astles, G. Blackmore, N. Gordon, and D. R. Wight Aug. 1984 20 p
(AD-A149418; RSRE-MEMO-3733; DRIC-BR-93713) Avail: NTIS HC A02/MF A01 CSCL 20/2

The use of alternative solvents, in particular Bi and In, has been investigated for the LPE growth of CdTe thin films at temperatures down to 250 C. In comparison with earlier work using Te as the solvent, this approach has several benefits: (1) improved surface topography, (2) more complete solution removal, (3) more abrupt interfaces, and (4) improved electrical properties. SIMS measurements showed that the layers grown from Bi solutions contained 0.1 ppma Bi, while those grown from In solutions contained approx. 100 ppma In. Doping experiments using In, Sb, and As were performed using Bi as the solvent. GRA

N85-19854# University of Southern California, Los Angeles. Dept. of Materials Science.
SOME INVESTIGATIONS OF MOLECULAR BEAM EPITAXIAL GROWTH OF 3-5 SEMICONDUCTOR FILMS VIA MONTE-CARLO COMPUTER SIMULATIONS, CARRIER TUNNELING AND SPECTROSCOPIC ELLIPSOMETRY Annual Report, 15 Apr. 1983 - 31 Jan. 1984
A. Madbukar 15 Feb. 1984 5 p
(Contract F49620-83-C-0074)
(AD-A149465; AFOSR-84-1234TR) Avail: NTIS HC A02/MF A01 CSCL 20/2

Experimental work this past year was primarily directed toward enhancing the growth and characterization capabilities of the PI's laboratory. Significant improvements were completed on the MBE system and the in-situ ellipsometry apparatus was demonstrated in a bread board setup. Theoretical work consisted of preliminary Monte-Carlo investigation of the MBE growth 3-5 compounds. Extensive progress was made on modeling the phase separation occurring during growth of Al(x)Ga(1-x)As on (110) GaAs. A mismatch induced, strain dependent exchange reaction between Al and Ga was shown to give long period variations in the Al concentration. The specific predictions of the theory will be tested in a collaborative effort with JPL. GRA

N85-19855# Department of the Air Force, Washington, D.C.
METHOD FOR SYNTHESIZING INDIUM PHOSPHIDE Patent Application
J. A. Adamski, inventor (to Air Force) Filed 17 Oct. 1984 19 p
(AD-D011475; US-Patent-Appl-SN-661623) Avail: NTIS HC A02/MF A01 CSCL 20/2

This invention relates in general to the synthesis of highly pure, crystalline, indium phosphide (InP). In a more particular aspect, this invention concerns itself with a method for synthesizing crystalline InP under pressures of from about 5 to 30 atmospheres. GRA

N85-19856*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
STRESS STUDIES IN EFG Quarterly Progress Report, 1 Apr. - 30 Jun. 1984
15 Aug. 1984 70 p refs
(Contracts NAS-7-100; JPL-956312)
(NASA-CR-175488; DE85-001707; DOE/JPL-956312-08; NAS 1.26:175488) Avail: NTIS HC A04/MF A01 CSCL 20L

Electrical characterization of defects induced in FZ and CZ silicon stress in four-point bending above 1200 C was started. Techniques to study electrical activity that will permit correlation of defect activity with diffusion length and with room and low temperature EBIC are being developed. Preliminary characterization of defects in ribbon grown at very low speeds of less than 1 cm/min shows that the dislocation density is very low over significant regions of cross section, while regions of high dislocation density (approx. 5 x 10(6)/cm(2)) occur in bands in a number of places. Addition measurements of stress distributions in EFG material were obtained at the University of Illinois using shadow-Moire interferometry. DOE

N85-19857# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
RESONANT ACTIVATION OF A JOSEPHSON JUNCTION
Michel H. Devoret, John M. Martinis, Daniel Esteve, and John Clarke Aug. 1984 6 p refs Presented at the 17th Intern. Conf. on Low Temperature Phys., Karlsruhe, 15-22 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000702; LBL-18195; CONF-840842-30) Avail: NTIS HC A02/MF A01

The lifetime of the zero voltage state of a current-biased Josephson junction is reduced by the application of a weak microwave perturbation at a frequency near the plasma frequency of the junction. We call this process resonant activation. The experimental data are in good agreement with numerical simulations. DOE

N85-19858# Tennessee Univ., Knoxville. Dept. of Physics and Astronomy.
VACUUM ULTRAVIOLET ELECTRONIC PROPERTIES OF LIQUIDS Annual Progress Report, 1 Feb. 1984 - 31 Jan. 1985
Linda R. Painter 1984 30 p refs
(Contract DE-AS05-76EV-03861)
(DE85-000305; DOE/EV-03861/49) Avail: NTIS HC A03/MF A01

Collective electronic oscillations in the silicone liquid Dow Corning 705 were examined. Newly analyzed data on electron bombardment gave better agreement with results of analyzed vuv optical reflectance values for energy loss than earlier results indicated. As previously reported, electron and photon mean free paths and absolute photoyields were calculated from reanalyzed liquid water data in the 2 to 25 eV region. These electron mean free paths were calculated from formamide electron mean free paths scaled for valence electron density. The formamide mean free paths were derived using Born approximation by Ashley and Williams. An alternate approach to calculation of electron mean free path in organic and inorganic matter proposed by Seah and Dench was followed. A survey of a range of liquids with request to reflectivity and photoemission was completed. As a result, a series of n-ethylene glycols with particularly high dipole moments as chosen for study. Ethylene glycol, diethylene glycol, triethylene glycol and tetraethylene glycol were studied. DOE

N85-19859# Sandia Labs., Albuquerque, N. Mex.
ION IMPLANTED LATERAL IN 2Ga 8As/GaAs STRAINED-LAYER SUPERLATTICE PHOTODECTOR
G. E. Bulman, D. R. Myers, J. J. Wiczer, L. R. Dawson, R. M. Biefeld, and T. E. Zipperian 1984 15 p refs Presented at the Intern. Electron Devices Meeting, San Francisco, 10 Dec. 1984
(Contract DE-AC04-76DP-00789)
(DE85-001365; SAND-84-1581C; CONF-841234-2) Avail: NTIS HC A02/MF A01

A Be(+) implanted lateral In 2Ga 8As/GaAs SLS photodetector was fabricated. The devices exhibit good reverse bias characteristics with dark current of less than 6nA at -60 V. Quantum efficiency measurements indicate an uncoated external value of 50% at 20V. Position resolved photocurrent measurements show that carrier collection occurs over a large area (100 micron m x 250 micron m at -50V) with capacitance values less than 1 pF. This is the first demonstration of a photodetector which utilizes the preferred direction of conduction that occurs in superlattice structures. DOE

N85-19860# Argonne National Lab., Ill. Materials Science and Technology Div.
MAGNETIZATION OF VERY THIN Ni FILMS IN EPITAXIAL METAL FILM SANDWICHES OF Cu
L. R. Sill (Northern Illinois Univ., Dekalb), M. B. Brodsky, S. Bowen, and H. C. Hamaker Sep. 1984 13 p refs Presented at the Magnetism and Magnetic Mater. Conf. and Exhibit, San Diego, Calif., 27-30 Nov. 1984
(Contract W-31-109-eng-38)
(DE85-001840; CONF-841184-7) Avail: NTIS HC A02/MF A01

Single crystal nickel films varing in thickness from 2 to 40 A were prepared by epitaxial growth between thicker layers (500 A) of single-crystal copper (001). Their magnetization was measured

as a function of field up to 10 kOe using a DC SQUID magnetometer. The saturation magnetization of these films was determined as a function of Ni thickness at liquid helium temperatures. A decrease in saturation moment from that of bulk nickel was observed for films of thickness less than 18 A. The apparent Curie temperature also decreases with decreasing thickness for these films. The magnetization at maximum field as function of temperature does not follow a Brillouin function. DOE

N85-19861# California Univ., Berkeley. Lawrence Berkeley Lab. Center for Advanced Materials.
APPLICATIONS OF THE HEAVY-IRON RUTHERFORD BACKSCATTERING SPECTROMETRY (HIRBS) TO THE ANALYSIS OF CONTACT STRUCTURES ON GaAs AND Ge
K. M. Yu, J. M. Jaklevic, and E. E. Haller Sep. 1984 15 p refs Presented at the Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12-14 Nov. 1984 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE85-000671; LBL-18466; CONF-841117-13) Avail: NTIS HC A02/MF A01

The use of Heavy-ion Rutherford backscattering spectrometry (HIRBS) for the analysis of layered structures on GaAs and Ge substrates was studied. Direct comparisons of data obtained using both (16)O and (4) He projectiles for the characterization of contact structures have demonstrated the advantages of HIRBS for the study of substrates with increased atomic masses due to the improved mass resolution of the method for high Z materials. Results obtained from a study of thermally induced interactions between Ga As and Ge substrates and the metals Pt and Pd are presented. Results of the analysis of multiple layered structures on GaAs and GaAlAs substrate with HIRBS are also discussed. DOE

N85-19862# Argonne National Lab., Ill. Materials Science and Technology Div.
FERMI SURFACE STUDY OF CeSb
H. Aoki, G. W. Crabtree, W. Joss (Eidgenoessische Technische Hochschule, Zurich), and F. Hulliger (Eidgenoessische Technische Hochschule, Zurich) Sep. 1984 13 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27-30 Nov. 1984
(Contract W-31-109-ENG-38)
(DE85-002532; CONF-841184-6) Avail: NTIS HC A02/MF A01

A Fermi surface study of the ferromagnetic phase of CeSb is presented. The gamma frequency branches arising from the electron surfaces at the X points, three separate frequency branches from the hole surfaces at the gamma point and the low frequency branch alpha have been observed. The effective mass ratios are low and range from approx. 0.2 for the alpha branch to approx. 1.0 for the high frequency branch of gamma. The low effective mass ratios suggest that the admixture of the conduction states with the f state is small. A drastic change in the appearance of the dHvA signal was observed at the phase transition between the ferromagnetic and lower field antiferromagnetic phases: the low frequency alpha oscillation suddenly disappears as the crystal enters the antiferromagnetic phase. By utilizing the change in the signal appearance, the transition field strength was measured as a function of the field direction. Present experimental results, particularly the origin of the alpha oscillation, are discussed in the light of the p-f mixing theory and band structure calculations based on localized f orbitals. DOE

N85-19863# State Univ. of New York, Stony Brook. Dept. of Materials Science and Engineering.
MICROSTRAIN ANALYSIS IN BENT SINGLE CRYSTAL SILICON BY DOUBLE CRYSTAL X-RAY TOPOGRAPHY TECHNIQUE M.S. Thesis
Mohamed Mehdi Emamian May 1984 95 p refs
(Contract DE-AC02-80ER-10740)
(DE85-000422; DOE/ER-10740/13) Avail: NTIS HC A05/MF A01

In many important materials engineering applications such as integrated circuit devices, thin film amorphous solar cells, magnetic thin films and corrosion protection, it is important to obtain the maximum mechanical integrity of film-substrate interfaces in order to maintain uniformity of desired properties. Since the various deposition methods for fabricating film-substrate combinations produce internal strains in the material, it is convenient to devise a suitable method for monitoring these strains. Though limited in ultimate geometrical resolution, X-ray methods have the advantages of extremely high strain sensitivity and the ability to vary penetrating depth through the control of wavelength; they are nondestructive, and with modern computer control assistance, analysis can be made rapidly, accurately and safely. No commercial camera is currently available to fully exploit this new technology. The design and application of an automated double crystal X-ray diffraction topography camera capable of measuring radii of curvature over a range of 0.2 to 1000 meters for crystals bend due to internal stress is examined. DOE

N85-19864# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.
QUASI-THERMODYNAMIC PREDICTION OF HYDROGEN REEMISSION BEHAVIOR FROM TITANIUM FILMS
Y. Hirooka, R. W. Conn, and D. M. Goebel Oct. 1984 38 p refs
(Contracts DE-AT03-84ER-52104; DE-AT03-80ER-52062)
(DE85-003667; UCLA-ENG-8437; PPG-826) Avail: NTIS HC A03/MF A01

A simple method is proposed to describe the hydrogen reemission behavior from a reactive metal film in which the implanted hydrogen concentration may exceed the dilute solution range under some conditions. In this method, the conventional thermodynamic information for the metal system, namely, the phase diagram and the P-C-T (pressure-concentration-temperature) relation, is used extensively to determine the reemitted hydrogen flux. As a specific case, this method has been applied to the hydrogen reemission from a titanium film. DOE

N85-19865# Argonne National Lab., Ill.
STUDY OF MAGNETISM AT SURFACES BY SCATTERING OF NEUTRONS AT GRAZING INCIDENCE
G. P. Felcher Jul. 1984 3 p refs Presented at the Intern. Conf. on Neutron Scattering in the '90s, Juelich, West Germany, 14 Jan. 1985
(Contract W-31-109-eng-38)
(DE84-015850; CONF-850110-1) Avail: NTIS HC A02/MF A01

Neutrons can provide information on magnetic phenomena at surfaces. The simplest experiment involves the measurement of the reflectivity of a well-collimated beam from the surface, as a function either of the neutron wavelength or of the angle of incidence theta sub i. Using polarized neutrons, the spin-dependent reflectivity of a magnetically-active material can determine the depth profile of the magnetic induction B. A prototype instrument at the Intense Pulsed Neutron Source at Argonne demonstrated the feasibility of this technique in determining the penetration depth of an external magnetic field in superconductors. Further experiments are being planned to study the magnetic disturbances close to the surface of ferromagnets; a first experiment on films of iron oxides showed a remarkable change of the magnetic depth profile with increasing oxidation. DOE

N85-19866# California Univ., San Diego. Inst. of Pure and Applied Physical Sciences.
LOW TEMPERATURE PROPERTIES OF CeOs2 IN THE C14 AND C15 CRYSTALLOGRAPHIC LAVES PHASES
M. S. Torikachvili, K. N. Yang, M. B. Maple, and G. P. Meisner (Los Alamos National Lab.) 1984 12 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27 Nov. 1984
(Contract W-7405-eng-36)
(DE85-003754; LA-UR-84-3487; CONF-841184-19) Avail: NTIS HC A02/MF A01

The compound CeOs2 was prepared in both cubic C15 and hexagonal C14 Laves phases. Measurements of ac and dc magnetic susceptibility, electrical resistivity, and specific heat were performed on samples of both phases. The C14 phase was found

to exhibit superconductivity with a superconducting transition temperature T sub c of 1.1(0)K, while the C15 phase does not display superconductivity above 70 mK. Both phases exhibit a slight exchange enhancement of the susceptibility. The curves of resistivity vs temperature for both phases exhibit strong negative curvature which are reminiscent of other valence fluctuation compounds. DOE

N85-19867# Argonne National Lab., Ill.
APPLICATION OF NbN FILMS TO THE DEVELOPMENT OF VERY HIGH FIELD SUPERCONDUCTING MAGNETS
R. T. Kampwirth, D. W. Capone, II, K. E. Gray, and A. Vicens Sep. 1984 5 p refs Presented at the Appl. Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract W-31-109-eng-38)
(DE85-002729; CONF-840937-17) Avail: NTIS HC A02/MF A01

The preliminary results demonstrating the feasibility of using niobium nitride (NbN) films as practical high field superconductors are reported. Films of varying thicknesses (2 to 9 micro m) were deposited on sapphire and Hastelloy substrates, using dc magnetron sputtering. The superconducting transition temperatures T/sub c/ of these films range from 11 to 15 K. Using the WHH extrapolation, upper critical fields H/sub 2c/(0) up to 40 T in the parallel direction and 48 T in the perpendicular direction were obtained. Critical current densities J/sub c/(H,4.2 K) were approx. - 1x10(4) A/cm(2) at 20 T in both the parallel and perpendicular directions. The preliminary results from novel sample preparation technique for TEM studies of film cross sections are briefly described. This technique shows the variation in film structure as a function of distance from the substrate. DOE

N85-19868# California Univ., Livermore. Lawrence Livermore Lab.
QUASIPARTICLE AGGREGATION IN THE FRACTIONAL QUANTUM HALL EFFECT
R. B. Laughlin 6 Aug. 1984 14 p refs Presented at the 17th Intern. Conf. on the Phys. of Semiconductors, San Francisco, 6 Aug. 1984 Submitted for publication
(Contract W-7405-eng-48)
(DE85-001574; UCRL-91618; CONF-840879-10) Avail: NTIS HC A02/MF A01

Quasiparticles in the fractional quantum Hall effect behave qualitatively like electrons confined to the lowest landau level, and can do everything electrons can do, including condense into second generation fractional quantum Hall ground states. The reasoning leading to variational wavefunctions for ground state and quasiparticles in the 1/3 effect is reviewed. It is shown how two-quasiparticle eigenstates are uniquely determined from symmetry, and how this leads in a natural way to variational wavefunctions for composite states which have the correct densities (2/5, 2/7, ---). It is also shown that the boson, anyon and fermion representations for the quasiparticles used by Haldane, Halperin, and Laughlin are all equivalent. A simple way to derive Halperin's multiple-valued quasiparticle wavefunction from the correct single-valued electron wavefunction is demonstrated. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-19869# Ballistic Research Labs., Aberdeen Proving Ground, Md.
APPLICATION OF MONTE CARLO AND MOLECULAR DYNAMICS METHODS TO THE CALCULATION OF THERMODYNAMIC PROPERTIES OF MOLTEN SALTS
R. D. Murphy Oct. 1984 17 p
(DA Proj. 1L1-62618-AH-80)
(AD-A148897; AD-F300523; BRL-MR-3395) Avail: NTIS HC A02/MF A01 CSCL 19/1

This report summarizes the work done during the course of an ARO Summer Faculty grant at the Ballistic Research Laboratory. The technical details will be reported elsewhere. The current state of knowledge of the structural properties of hydroxylammonium nitrate (HAN) is summarized. The possibility of determining these properties by computer simulation is discussed. The features of the Monte Carlo and Molecular Dynamics approaches to computer simulation are briefly reviewed; the former method has more promise for the present problem, and its application is explored. A formula not previously found in the literature was derived for the heat capacity at constant pressure for a system at given density and temperature from a single Monte Carlo run. GRA

N85-19870# California Univ., Livermore. Lawrence Livermore Lab.
THERMODYNAMICS OF THE REACTIVE FLOW MODEL
Gerald L. Nutt 14 Nov. 1984 15 p refs
(Contract W-7405-eng-48)
(DE85-004405; UCID-20277) Avail: NTIS HC A02/MF A01

The explosive is assumed to undergo a hyrodynamic shock which initiates the chemical decomposition into product gases. The resulting fluid is regarded as two separate phases (reactant and product) at a common pressure. A reactive flow model is constructed which can be substituted for an equation of state subroutine in a hydrodynamic computer code. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-19871# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE R AND D PROJECT SELECTION PROBLEM WITH FUZZY COEFFICIENTS
Oscar Pereira Dias, Jr. Oct. 1984 39 p refs Submitted for publication
(INPE-3329-PRE/626) Avail: NTIS HC A03/MF A01

The multicriteria project selection problem subject to linear constraints, with zero-one decision variables is examined. Linguistic rather than numerical values are used in the project appraisals for each criterion, with their meanings represented by fuzzy sets. The grade of membership of a given alternative, in the fuzzy set of all nondominated alternatives, is computed by an algorithm that converges rapidly on the final solution. Continuity is the only restriction imposed on the membership functions. An example of the overall procedure and topics for future research are presented. Author

N85-19872# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
COORDINATION IN A DISTRIBUTED PROBLEM SOLVING NETWORK
D. D. Corkill and V. R. Lesser 1984 11 p
(Grant NSF MCS-80-06327)
(AD-A148925) Avail: NTIS HC A02/MF A01 CSCL 05/1

Distributed problem solving networks provide an interesting application area for high-level network coordination through the use of organizational structuring. We describe a decentralized

approach to the coordination of these networks that relies on each node making sophisticated local activity decisions. Each node is guided by a high-level strategic plan for cooperation among nodes in the network and must balance its own perceptions of appropriate problems solving activity with activities deemed important by other nodes. The high-level strategic plan, which is a form of meta-level control, is represented as a network organizational structure specifying in a general way the information and control relationships among the nodes. In addition to its application to Distributed Artificial Intelligence, this research has implications for organizing and controlling complex knowledge-based systems that involve semi-autonomous problem solving agents. GRA

N85-19873# Loughborough Univ. of Technology (England). Dept. of Civil Engineering.
EXPERT SYSTEMS IN CONTRACT MANAGEMENT: A PILOT STUDY Interim Report
E. G. Trimble, R. J. Allwood, and F. C. Harris Dec. 1984 5 p
(Contract DAJA45-84-C-0024; DA Proj. 1T1-61102-BH-57)
(AD-A149363; AD-F300533) Avail: NTIS HC A02/MF A01 CSCL 05/1

It is reported that Linking of an expert system and a planning program has been achieved; there are now four collaborating contractors; knowledge is being assembled within two of the collaborating companies; six system shells have been evaluated; extensions to the materials handling application have been explored; several important conclusions were drawn from a visit by Mr Frank Kearney; and a teach-in will be held for future expert system applications. GRA

N85-19874# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
STRATEGIC MANAGEMENT FOR ORGANIZATIONAL EFFECTIVENESS. THE EFFECT OF HUMAN RESOURCE PLANNING ON RETENTION AND RELATED ISSUES, VOLUME 1 Final Report
L. S. Oppenheim, S. D. Hyman, and C. T. Kydd Dec. 1984 137 p
(Contract N00014-82-C-0803)
(AD-A149398; ONR-FR-1-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 05/1

This study assessed the match between strategic direction, human resource policies and the perceptions of those policies held by middle managers in five successful organizations. Human resource practices related to retention -- job movement, organizational signals, and incentives -- were the focus of three separate studies. The results indicated that the strategic considerations of these organizations were well served by their human resource practices although the configuration of policies and practices differed. The research also indicated that these effective organizations exhibited greater flexibility in interpreting policy and enforcing boundaries in areas in which they needed information to innovate and adapt. GRA

N85-19875# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
STRATEGIC MANAGEMENT FOR ORGANIZATIONAL EFFECTIVENESS. THE EFFECT OF HUMAN RESOURCE PLANNING ON RETENTION AND RELATED ISSUES, VOLUME 2 Final Report
L. S. Oppenheim, S. D. Hyman, and C. T. Kydd Dec. 1984 123 p
(Contract N00014-82-C-0803)
(AD-A149399; ONR-FR-1-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 05/1

This study assessed the match between strategic direction, human resource policies and the perceptions of those policies held by middle managers in five successful organizations. Human resource practices related to retention -- job movement, organizational signals, and incentives -- were the focus of three separate studies. Results from the studies were combined with information from formal documents and interviews to form the basis for comparative case studies. Approximately 100 managers at each of the six sites contributed to these results. Key findings were: (1) a model of job movement which took expectations into account was a good predictor of the way in which a manager and his boss divided tasks; (2) the rate of movement from one job to the next was more rapid in organizations where jobs were clearly and narrowly defined than when jobs evolved and expanded over time; (3) signals from the organization which were public, positive and relevant to a manager's goals increased the likelihood of his remaining with the organization; (4) managers were more likely to see themselves as resource constrained if goal setting and resource allocation were decided at different levels in the organization; (5) informal incentives were more salient to middle managers than most formal incentives. GRA

N85-19876# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
STRATEGIC MANAGEMENT FOR ORGANIZATIONAL EFFECTIVENESS. THE EFFECT OF HUMAN RESOURCE PLANNING ON RETENTION AND RELATED ISSUES, VOLUME 3 Final Report
L. S. Oppenheim, S. D. Hyman, and C. T. Kydd Dec. 1984 78 p
(Contract N00014-82-C-0803)
(AD-A149400; ONR-FR-1-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 05/1

This research evaluated the match between strategic direction, human resource policies and the perceptions of those policies held by middle managers in five successful organizations. Human resource practices related to retention -- job movement, organizational signals, and incentives -- were the focal points of three separate studies. Results from the studies were combined with data from formal documents and interviews to form the basis for comparative case studies. The key research findings were: (1) a model of job movement which took expectations into account was a good predictor of the way in which a manager and his boss divided tasks; (2) the rate of movement from one job to the next was faster in organizations where jobs were clearly and narrowly defined than when jobs evolved and expanded over time; (3) signals from the organization which were public, positive and related to a manager's goals increased the likelihood of his remaining with the organization; (4) managers were more prone to see themselves as resource constrained if goal setting and resource allocation were decided at different levels in the organization; (5) informal incentives were more salient to middle managers than most formal incentives. GRA

N85-19877# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
STRATEGIC MANAGEMENT FOR ORGANIZATIONAL EFFECTIVENESS. THE EFFECT OF HUMAN RESOURCE PLANNING ON RETENTION AND RELATED ISSUES: METHODOLOGICAL APPENDIX Final Report
L. S. Oppenheim, S. D. Hyman, and C. T. Kydd Dec. 1984 139 p
(Contract N00014-82-C-0803)
(AD-A149401; ONR-FR-1-App) Avail: NTIS HC A07/MF A01 CSCL 05/1

This research studied the relationship between strategic direction, human resource policies and the perceptions of those policies held by middle managers in five successful organizations. Human resource practices dealing with retention -- job movement, organizational signals, and incentives -- were the focus of three different studies. Information from the studies were combined with information from formal documents and interviews to form the basis for comparative case studies. The main reseach findings were: (1) a model of job movement which took expectations into consideration was a good predictor of the way in which a manager and his boss divided tasks; (2) the rate of movement from one job to the next was more rapid in organizations where jobs were clearly and narrowly defined than when jobs evolved and expanded over time; (3) signals from the organization were public, positive and relevant organization; (4) managers were more likely to envision themselves as resource constrained if goal setting and resource

allocation were decided at different levels in the organization; (5) informal incentives were more salient to middle managers than most formal incentives. GRA

N85-19878# Army War Coll., Carlisle Barracks, Pa.
THE EVOLUTION FROM DATA PROCESSING TO INFORMATION RESOURCE MANAGEMENT
S. P. Plusch 16 May 1984 33 p
(AD-A149429; AD-E500690) Avail: NTIS HC A03/MF A01 CSCL 05/1

With the tremendous growth in the capability, complexity, pervasiveness, and cost of information systems in recent years, corporate America has realized that information is a vital corporate asset (resource) and must be managed as such. Congress has mandated that Federal agencies improve their ability to manage information through the Brooks Act of 1965 and the Paperwork Reduction Act of 1980 (also sponsored by Congressman Brooks). The process of gaining control of an organization's information has been called information Resource Management (IRM). This paper is a survey of the essential elements of IRM focusing on methods that are used to develop an Information Systems Architecture (ISA). This is particularly timely since HQDA recently completed a Information System's Planning (ISP) exercise, and created a new Deputy Chief of Staff for Information Management (DCSIM). A summary of the important findings of this study are presented. The late Bernard Shaw once wrote, To be in Hell is to drift, to be in Heaven is to sheer. This paper attempts to survey the course for planning the near and long-term information needs of large organizations including the U.S. Army. GRA

N85-19879# Department of Defense, Washington, D. C.
DEPARTMENT OF DEFENSE, OFFICE OF INSPECTOR GENERAL SEMIANNUAL REPORT TO THE CONGRESS, 1 APRIL - 30 SEPTEMBER 1984
29 Nov. 1984 106 p
(AD-A149560) Avail: NTIS HC A06/MF A01 CSCL 15/5

A few of the results of this coordinated effort are: Documented savings and cost avoidances have nearly doubled in each of the last 3 years. Over the past three years, we have completed 156,410 corrective actions on 50,939 DoD internal audit reports, giving the Department $3.5 billion worth of monetary benefits. The Department has been diligent in suspending or debarring individuals or corporations who abuse the procurement process and has made use of this powerful administrative tool over 1,041 times since 1980--402 times in FY 1984 alone--an increase of 66 percent over the previous year. From June 1981 to September 1984, the DoD Hotline got over 19,000 contacts through calls and letters. Last summer Secretary Weinberger announced a 10-point program to reform spare parts procurement. In addition to changing a number of spare parts buying practices, the Secretary asked us to audit every major buying agency in DoD to learn whether his reforms would solve the systemic problems inherited in spare parts procurement. We made a random DoD-wide check of prices for spare parts and found that out of a sample of 2,300 items, 823--or 36 percent--were overpriced, with a total overpricing of about $17.5 million. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-19880# Ad Hoc Committee on Depository Library Access to Federal Automated Data Bases.
PROVISION OF FEDERAL GOVERNMENT PUBLICATION IN ELECTRONIC FORMAT TO DEPOSITORY LIBRARIES
Washington GPO 1984 137 p Rept. presented by the Ad Hoc Comm. on Depository Library Access to Federal Automated Data Bases to the Joint Comm. on Printing, 98th Congr., 2nd Sess., 1984
(S-Prt-98-260; GPO-37-868) Avail: SOD HC as SN-052-070-05970-2

Federal Government information is increasingly being stored and retrieved through new technologies rather than through traditional formats of paper and microform (with the result) that an increasing amount of information in electronic format is not being provided to depository libraries. The feasibility and desirability of providing access to Federal Government information in electronic formats to the public through the congressional depository libraries was investigated. Factors examined include: (1) the kind and amount of Federal Government information in electronic format; (2) whether depository libraries have the ability to access the new formats; and (3) the costs and benefits of providing information in electronic format. Major policy areas which should be addressed in order to meet the intent of pertinent provisions of title 44, United States Code, to make Government information publicly vailable to citizens at no charge through the depository library system were also identified. A.R.H.

N85-19881# Texas A&M Univ., College Station. Dept. of Management.
A PROPOSED INTEGRATION AMONG ORGANIZATIONAL INFORMATION REQUIREMENTS, MEDIA RICHNESS AND STRUCTURAL DESIGN
R. L. Daft and R. Lengel Nov. 1984 64 p
(Contract N00014-83-C-0025)
(AD-A149317; TR-ONR-DG-10) Avail: NTIS HC A04/MF A01 CSCL 05/2

This paper argues that information processing in organizations is influenced by two forces--equivocality and uncertainty. Equivocality is reduced through the use of rich media and the enactment of a shared interpretation among managers (Weick, 1979). Uncertainty is reduced by acquiring and processing additional data (Galbraith, 1973; Tushman and Nadler, 1978). Elements of organization structure vary in their capacity to reduce equivocality versus uncertainty. Models are proposed that link structural characteristics to the level of equivocality and uncertainty that arise from organizational technology, interdepartmental relationships, and the environment. GRA

N85-19882# Illinois Univ., Champaign. Human Attention Research Lab.
TOWARD A MODEL OF ATTENTION AND THE DEVELOPMENT OF AUTOMATIC PROCESSING
W. Schneider Sep. 1984 17 p
(Contract N00014-84-K-0008)
(AD-A149348; AD-E751073; HARL-ONR-8402) Avail: NTIS HC A02/MF A01 CSCL 09/4

A model for the development of automatic processing is briefly described. The model is a quasi-neural model in which information processing is done through the transmission of vectors between visual, lexical, semantic, and motor processing units. Controlled processing involves gating of the output power of vectors to perform matches and to release response vectors. As subjects practice consistent tasks, associative learning enables an input vector to evoke an output vector and priority learning determines the power with which a vector is transmitted. Automatic processing involves a cascade of vector transmissions in which the output power of each transmission is determined by priority learning. The transition from controlled to automatic processing takes place in four phases. Empirical illustrations of the transition are described. GRA

N85-19883# Texas A&M Univ., College Station. Dept. of Management.
ORGANIZATIONS AS INFORMATION PROCESSING SYSTEMS. TOWARD A STRATEGIC CONTINGENCIES MODEL OF BUDGET RELATED INFLUENCE IN MUNICIPAL GOVERNMENT ORGANIZATIONS
G. A. Giroux, A. G. Mayper, and R. L. Daft Oct. 1984 63 p
(Contract N00014-83-C-0025)

(AD-A149364; AD-F300533; TR-DG-11-ONR) Avail: NTIS HC A04/MF A01 CSCL 05/2

This paper explores the relationship between budgeting and perceived power in city government organizations. Data are reported from a survey of perceived budget influence in six city governments in Texas. During budget formulation city managers were perceived as having the most vertical power, followed by the city council, department heads, and department employees. During budget implementation, there was a perceived increase in department head vertical power and a decrease in city council power. Perceptions of horizontal power suggested that budget departments generally had greater perceived influence than operating departments for budget related issues. The findings are used to develop a strategic contingencies model of budget-related power, and to suggest some research steps for testing the proposed model. Author (GRA)

N85-19884# Online Computer Systems, Inc., Germantown, Md.
THE INTEGRATED LIBRARY SYSTEM DESIGN CONCEPTS FOR A COMPLETE SERIALS CONTROL SUBSYSTEM
20 Aug. 1984 105 p
(Contract MDA903-82-C-0535)
(AD-A149379; AD-F300533) Avail: NTIS HC A06/MF A01 CSCL 05/2

The Integrated Library System (ILS) is a minicomputer-based automated library system that supports technical processing, retrieval, and bibliographic management activities utilizing a single master bibliographic file that is capable of supporting all library functions. This document presents the design concepts for the complete serials control subsystem which will include capabilities for check-in of serials and continuations, expansion of the current serials holding record, claims of missing issues, routing of individual issues, binding control, notice generation, and a centralized vendor file. All file structure is MARC compatible. GRA

N85-19885# Army Health Care Studies and Clinical Investigation Activity, Fort Sam Houston, Tex.
CATALOG OF COMPLETED STUDIES, US ARMY HEALTH CARE STUDIES AND CLINICAL INVESTIGATION ACTIVITY
10 Dec. 1984 52 p
(AD-A149450) Avail: NTIS HC A04/MF A01 CSCL 05/2

A list of reports on health care and dental care delivery studies completed by this activity to date is presented. GRA

N85-19886# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES. VOLUME 39, NUMBER 1 Monthly Publication
L. E. Shaffer, ed. Jan. 1985 39 p
(AD-A149498; ESN-39-1) Avail: NTIS HC A03/MF A01 CSCL 05/2

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European science and technology and to the institutions and people responsible for these efforts. ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research and Standardization Group. Qualified US scientists travelling in Europe may also be invited to author an ESN article. GRA

N85-19887# Pacific Northwest Lab., Richland, Wash.
SOME DATA MANIPULATION REQUIREMENTS FOR THE EXPLORATORY ANALYSIS OF LARGE DATA SETS
Richard J. Littlefield, Paula J. Cowley, and Mark A. Whiting Jun. 1984 5 p refs Presented at the 9th Intern. CODATA Conf., Jerusalem, 24-28 Jun. 1984
(Contract DE-AC06-76RL-01830)
(DE85-002541; PNL-SA-12330; CONF-8406139-7) Avail: NTIS HC A02/MF A01

Exploratory data analysis is an iterative process in which the results of one analysis step suggest several new ways of viewing and further analyzing the data. Because analysis is iterative, the analysis and data management tools must be integrated so that analysis results are preserved for subsequent use. Data of many different shapes and sizes must be stored. Efficient storage of multiple versions and subsets of data are needed to support multiple analysis paths. No single data management package provides all these capabilities, although various existing packages are identified that provide them individually. There is also a need for automatic tracking of analysis paths and steps. A new approach to data analysis management, using data analysis environments was developed and is being implemented to meet these data manipulation requirements. DOE

N85-19888# Geological Survey, Reston, Va.
STRUCTURE AND APPLICATION OF EXTREMELY LARGE GEOPHYSICAL DATA BASES Final Report
Edward C. Escowitz 1984 20 p
(Contract DE-AI01-80ET-14389)
(DE85-003527; DOE/ET-14389/T1) Avail: NTIS HC A02/MF A01

A unique data base design was devised to handle massive quantities of gridded geophysical data and to support a variety of marine geologic applications. The structure of the data base allows for storage of mean grid-point values with covariables (number of observations, maximum, minimum, and standard deviation). The geographic review and cursor editing (GRACE) program was written for data base manipulation. A limited fine mesh option in the data base permits increased resolution in special study areas. The data base design was applied to marine bathymetric, magnetic, and gravity data. DOE

N85-19889# Hanford Engineering Development Lab., Richland, Wash.
CHARACTERISTICS OF QUALITY DATA
W. L. Delvin 1984 12 p Presented at 11th Ann. Conf. of the Am. Soc. for Quality Control's Energy Div., Las Vegas, 16 Sep. 1984
(Contract DE-AC06-76FF-02170)
(DE85-001203; HEDL-SA-3176; CONF-840996-3) Avail: NTIS HC A02/MF A01

A primary product of research and development is data, the quality of which should be of concern to both users and the scientists and engineers producing data. The literature offers only bits and pieces of information on the nature of quality as applied to data. Five characteristics of quality data were developed by refining and expanding several concepts found in the literature. These characteristics are validity, integrity, reliability, preservation, and retrievability. As presented in this paper, they provide a comprehensive treatment of the subject and they can provide a basis for assuring and assessing the quality of data. DOE

N85-19890# Texas Univ. at Dallas, Richardson.
KEYWORD THESAURUS: A LIST OF TERMS AND CODES TO IDENTIFY AREAS OF INTEREST FOR RESEARCH AND OTHER TYPES OF SPONSORED PROGRAMS (REVISED OCTOBER 1984)
J. A. Rodman Oct. 1984 54 p Sponsored in part by National Endowment for the Humanities
(Grant NSF PLN-81-09429)
(PB85-136893) Avail: NTIS HC A04/MF A01 CSCL 05B

This Keyword Thesaurus will bring about greater accuracy in matching the focus of announcements with the research interests of the faculty, time savings of staff in the resource identification process, more timely notification of the faculty, and improved relationships with the faculty. Precise classification of announcements, and an efficient matching system, allowing notification of and response by the most interested and qualified professors, will enhance the effective use of time and energy within the research community as well as within the government agencies. GRA

N85-19891# National Academy of Sciences - National Research Council, Washington, D. C.

RESEARCH NEEDS ON THE INTERACTION BETWEEN INFORMATION SYSTEMS AND THEIR USERS: REPORT OF A WORKSHOP Final Report
Oct. 1984 47 p refs
(Grant NSF IST-83-03062)
(PB85-121523) Avail: NTIS HC A03/MF A01 CSCL 05B

Workshop participants were requested to define the characteristics of information systems that distinguish them in terms of purpose, function, and structure; to estimate the trends of future technological developments; to define the significant behavioral and cognitive issues involved; and to formulate recommendations and justification for basic research most necessary to improve user/information system interaction. The Recommendations are general in nature and not tied to specific information systems. They cover theoryorientation, the acquisition and of information, input-output bandwidth, user training and support, cognitive effects of programming, information technology and jobs, and attitudes and accommodation. GRA

N85-19892# National Bureau of Standards, Gaithersburg, Md. Information Resources and Services Div.
ABSTRACT AND INDEX COLLECTION
Diane Cunningham, comp. Aug. 1984 48 p
(PB85-119501) Avail: NTIS HC A03/MF A01 CSCL 05B

An alphabetical arrangement of abstracts and indexes available at the National Bureau of Standards (NBS) Library is listed by most current title of the publication. Other information includes description of the abstract or index, library holdings, principal sources, publisher or association, corresponding data base and the classification number. A general subject and former title index are given. GRA

N85-19893# International Trade Administration, Washington, D.C.
COMPETITIVE ASSESSMENT OF THE US MANUFACTURING AUTOMATION EQUIPMENT INDUSTRIES Final Report
Jul. 1984 113 p refs
(PB85-103927) Avail: NTIS HC A06/MF A01 CSCL 05B

The present and future international competitiveness of the U.S. manufacturing automation equipment industries in terms of their principle businesses is examined. Machine tools, industrial robots, and computer aided manufacturing are discussed. U.S. and foreign government assistance to manufacturing automation is discribed, as is the current international competitiveness among these industries. R.J.F.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-19894*# Kumm (Emerson L.), Tempe, Ariz.
FEASIBILITY DEMONSTRATION OF A NOVEL, FLAT-BELT, CONTINUOUSLY VARIABLE TRANSMISSION OR AUTOMOTIVE AND ELECTRIC-HYBRID VEHICLE APPLICATION Final Report
Emerson L. Kumm May 1984 138 p Prepared for JPL
(Contracts DEN3-272; JPL-956602)
(NASA-CR-174430; JPL-9950-945; NAS 1.26:174430; DOE/CS-54209/20; KI-P-1008) Avail: NTIS HC A07/MF A01 CSCL 13F

The performance of a flat belt continuously variable transmission (CVT) over its design input speed, output torque, and speed ratio range was determined. The arrangement studied reduces the required width of the pulleys and their actuators as compared to pulleys whose sheaves are moved axially by actuators to vary the belt radius ratio or pulley speed ratio. Topics covered included: (1) flat belt transmission design; (2) variable speed assembly fabrication; (3) critical components; (4) variable speed assembly test stand; (5) test stand control rigs; (6) transmission tests; and (7) improvement assessment of the current design. Results show that the flat belt CVT appears to have significant advantages in reducing the size and weight of the automotive CVT as well as giving high operating efficiencies. A.R.H.

N85-19895*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INITIAL TESTING OF A VARIABLE-STROKE STIRLING ENGINE Final Report
Lanny G. Thieme Feb. 1985 28 p refs Presented at the 21st Aútomotive Technol. Develop. Contractors' Coordination Meeting, Dearborn, Mich., 14-17 Nov. 1983
(Contract DE-AI01-77CS-51040)
(NASA-TM-86875; DOE/NASA/51040-58; E-2336; NAS 1.15:86875) Avail: NTIS HC A03/MF A01 CSCL 13F

In support of the U.S. Department of Energy's Stirling Engine Highway Vehicle Systems Program, NASA Lewis Research Center is evaluating variable-stroke control for Stirling engines. The engine being tested is the Advenco Stirling engine; this engine was manufactured by Philips Research Laboratories of the Netherlands and uses a variable-angle swash-plate drive to achieve variable stroke operation. The engine is described, initial steady-state test data taken at Lewis are presented, a major drive system failure and subsequent modifications are described. Computer simulation results are presented to show potential part-load efficiency gains with variable-stroke control. Author

N85-19896# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF IMAGE REGISTRATION TECHNIQUE IN BRASILIA'S URBAN GROWTH MONITORING
Celina Foresti, Maria deLourdes Neves deOliveira, Madalena Niero, Ubirajara Mauricio Barsotti deLima, and Elza Maria deMorais Franco Parreiras (Companhia do Desenvolvimento do Planaldo Central) Oct. 1984 9 p refs Presented at the 18th Intern. Symp. on Remote Sensing of Environment, ERIM
(INPE-3302-PRE/614) Avail: NTIS HC A02/MF A01

This paper describes the use of an Image Registration Program in the studies of the urban growth. This program implemented in the Image-100 (Multispectral Images Analyzer) permits a quick identification of growing areas by means of he overlap of the same scene in two or three different dates, and the use of adequate filters. The city of Brasilia, Brazil, was selected for test area. The

dynamics of Brasilia urban growth was analyzed with overlap of scenes dated June 1973, 1978 and 1983. The results show the utilization of the Image Registration Technique for the monitoring of the urban growth. Author

N85-19897# Committee on the Judiciary (U. S. House).
HIGH-SPEED INTERCITY RAIL PASSENGER SERVICE
Washington GPO 1984 36 p refs Hearing on H. R. 4308 before the Subcomm. on Admin. Law and Govt. Relations of the Comm. on the Judiciary, 98th Congr., 2nd Sess., 11 Apr. 1984
(GPO-35-896) Avail: Subcommittee on Administrative Law and Governmental Relations

An interstate compact for the preparation of a feasibility study for the development of a system of high speed intercity rail passenger service was discussed. B.G.

N85-19898# City of Greenville, S.C.
ELECTRIFLEET PROJECT Final Report
Carl H. Burkhart, George M. McDaniel, James M. Morgan, Michael J. Horne, and Rhoda Denise Davis Aug. 1984 20 p
(Contract DE-FC08-79NV-10042)
(DE85-001598; DOE/NV-10042/1) Avail: NTIS HC A02/MF A01

Fifteen electric vehicles were operated and evaluated from July 1980 through June 1983. Four Battronic minivans and 11 EVA station wagons were operated by eight different departments, serving widely varying administrative needs. The project goals were: (1) to conserve petroleum fuel; (2) to learn electric vehicle technology; (3) to enhance public awareness of electric vehicles; (4) to evaluate the feasibility and effectiveness of electric vehicles; and (5) to achieve a net financial saving for the City. These goals are addressed and why these goals were or were not met is discussed in sections devoted to management, costs, operating data, maintenance, operator acceptance, and public awareness. DOE

N85-19899# City of San Jose, Calif. Dept. of General Services.
ELECTRIC-HYBRID VEHICLE (E-HV) DEMONSTRATION-TEST PROJECT Final Report
Fred D. Wright 9 Oct. 1984 7 p
(Contract DE-FC08-80NV-10110)
(DE85-002370; DOE/NV-10110/1) Avail: NTIS HC A02/MF A01

Electric vehicles were used for administrative transport, parts pickup and delivery, and for maintenance/service support tasks. The final evaluation of the project is mixed. The hoped for general consensus of support for electric vehicles did not evolve. The personnel who drove these vehicles complained of poor ride and lack of range. The project demonstrated the requirements for any future plans for electric vehicle use: (1) there must be greater vendor support for maintaining the vehicles (2) parts must be more readily available; (3) the vendors must be more stable; and (4) support for the project from the federal government. DOE

N85-19210# Joint Publications Research Service, Arlington, Va.
FRENCH COMMENTARY ON SOVIET INDUSTRIAL ESPIONAGE
Christian David and Jean Gloaguen *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-004) 30 Jan. 1985 p 61-69 Transl. into ENGLISH from Le Nouvel Econ. (Paris), 3 Dec. 1984 p 60-65 (For primary document see N85-19204 10-31)
Avail: NTIS HC A04/MF A01

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-19900*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FAR-INFRARED LINE OBSERVATIONS OF PLANETARY NEBULAE. 1: THE [O III] SPECTRUM
Harriet L. Dinerstein (Texas Univ., Austin), Daniel F. Lester (Texas Univ., Austin), and Michael W. Werner Feb. 1985 46 p refs Submitted for publication
(Contracts NASw-3159; NCA2-OR781-201; Grant NSF AST-80-20461)
(NASA-TM-86670; Rept-85091; NAS 1.15:86670; Preprint-Ser-026) Avail: NTIS HC A03/MF A01 CSCL 03A

Observations of the far-infrared fine structure lines of O III have been obtained for six planetary nebulae. The infrared measurements are combined with optical O III line fluxes to probe physical conditions in the gas. From the observed line intensity ratios, a simultaneous solution was obtained for electron temperature and density, as well as means of evaluating the importance of inhomogeneities. Densities determined from the far-infrared O III lines agree well density diagnostics from other ions, indicating a fairly homogeneous density in the emitting gas. Temperatures are determined separately from the O III 4363/5007 A and 5007 A/52 micron intensity ratios and compared. Systematically higher values are derived from the former ratio, which is expected from a nebula which is not isothermal. Allowance for the presence of temperature variations within these nebulae raises their derived oxygen abundances, determinations to be reconciled with the solar value. Author

N85-19901*# Massachusetts Univ., Amherst. Dept. of Physics and Astronomy.
BOUNDARY CONDITIONS FOR THE PALEOENVIRONMENT: CHEMICAL AND PHYSICAL PROCESSES IN THE PRE-SOLAR NEBULA Semiannual Status Report, 16 Aug. 1984 - 14 Feb. 1985
William M. Irvine and F. Peter Schloerb 14 Feb. 1985 10 p
(Grant NAGw-436)
(NASA-CR-174370; NAS 1.26:174370; SASR-4) Avail: NTIS HC A02/MF A01 CSCL 03A

Two additional hyperfine components of the interstellar radical C3H were detected. In addition, methanol was discovered in interstellar clouds. The abundance of HCCN and various chemical isomers in molecular clouds was investigated. R.S.F.

N85-19902*# California Univ., Berkeley. Space Sciences Lab.
RESEARCH IN EXTREME ULTRAVIOLET AND FAR ULTRAVIOLET ASTRONOMY Semiannual Status Report, 1 Jun. - 30 Nov. 1984
C. S. Bowyer 12 Mar. 1985 16 p refs
(Grant NGR-05-003-450)
(NASA-CR-174432; NAS 1.26:174432) Avail: NTIS HC A02/MF A01 CSCL 03A

The Far Ultraviolet imager (FUVI) was flown on the Aries class sounding rocket 24.015, producing outstanding results. The diffuse extreme ultraviolet (EUV) background spectrometer which is under construction is described. It will be launched on the Black Brant sounding rocket flight number 27.086. Ongoing design studies of a high resolution spectrometer are discussed. This instrument incorporates a one meter normal incidence mirror and will be suitable for an advanced Spartan mission. B.G.

N85-19903*# Navtrol Co., Dallas, Tex.
SOLAR OPTICAL TELESCOPE PRIMARY MIRROR CONTROLLER Final Report, Sep. 1979 - Aug. 1980
Richard J. Brown and Dankai Liu Aug. 1980 114 p
(Contract NAS5-25871)
(NASA-CR-174416; NAS 1.26:174416) Avail: NTIS HC A06/MF A01 CSCL 03A

The development of a technique to control the articulated

primary mirror (APM) of the solar optical telescope (SOT) is discussed. Program results indicate that a single, all digital controller has sufficient capability to totally handle the computational requirements for control of the SOT APM. R.S.F.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-19904*# Illinois Univ., Urbana-Champaign. Dept. of Physics.
INTERNATIONAL ULTRAVIOLET EXPLORER OBSERVATIONS OF AMORPHOUS HOT GALAXIES
Susan A. Lamb, John S. Gallagher, III, Michael S. Hjellming, and Deidre A. Hunter (Kitt Peak National Observatory) Aug. 1984 46 p refs
(Grant NAG5-362)
(NASA-CR-174354; NAS 1.26:174354; IAP-84-22) Avail: NTIS HC A03/MF A01 CSCL 03B

In order to better understand the nature of star formation processes in amorphous galaxies, short wavelength International Ultraviolet Explorer (IUE) spectra of galaxies NGC 1705 and NGC 1800 were obtained. The IUE data for NGC 1705 were of excellent quality while the low signal-to-noise NGC 1800 observation was useful only as a rough guide to the ultraviolet energy distribution. It was found that NGC 1705 contains a normal mix of OB stars, which is consistent with the nearly constant recent star formation rate inferred from new optical data. The NGC 1800 is likely to have similar properties, and blue galaxies with amorphous structures thus do not show evidence for anomalies in stellar mass distributions. The UV spectra of amorphous galaxies and a variety of other hot extragalactic stellar systems have similar characteristics, which suggests OB stellar populations often are homogeneous in their properties. Author

N85-19905*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
A SPECTROSCOPIC STUDY OF LMC X-4
L. D. Petro and W. A. Hiltner (Michigan Univ., Ann Arbor) [1982] 16 p refs Submitted for publication
(Contract NAS5-24441)
(NASA-CR-174414; NAS 1.26:174414; CSR-HEA-82-14) Avail: NTIS HC A02/MF A01 CSCL 03B

The orbital radial velocity semi-amplitude of the binary star system LMC X-4 primary was determined to be 37.9 + or - 2.4 km/s from measurements of the hydrogen absorption lines. The semi-amplitude of the He I and He II absorption lines are consistent with this, namely 44.9 + or - 5.0 and 37.3 + or - 5.3 km/s. The phase and shape of the radial velocity curves of the three ions are consistent with a circular orbit and an ephemeris based upon X-ray measurements of the neutron star, with the exception that the He II absorption line radial velocity curve has detectable shape distortion. Measurements of the He II LAMBOA 4686 emission line velocity are consistent with a phase shifted sine wave of semi-amplitude 535 km/s, a square wave of semi-amplitude 407 km/s, or high order harmonic fits. The spectral type was found to be 08.5 IV-V during X-ray eclipse. Variations to types as early as 07 occur, but not as a function or orbital phase. Absorption line peculiarities were noted on 6 of 58 spectra. Author

N85-19906# Maryland Univ., College Park. Dept. of Physics and Astronomy.
SOLAR RADIO BURSTS, PROTON EVENTS AND GEOMAGNETIC ACTIVITY
S. S. Degaonkar Hanscom AFB, Mass. AFGL Aug. 1984 43 p
(Contract F19628-83-K-0004)
(AD-A149018; AP-84-056; AFGL-TR-84-0259; SR-1) Avail: NTIS HC A03/MF A01 CSCL 03/2

The relationships between type 2, type 4, microwave bursts and geomagnetic activity have been studied using data from various observatories compiled in the Solar-Geophysical Data over the period 1968-1982. It is found that type 2 bursts follow the trend of solar activity in general, more bursts occurring during periods of high solar activity. A similar trend is also seen with type 4 bursts but their occurrence frequency is smaller than that of type 2 bursts. Superposed epoch analysis of geomagnetic activity index Ap before and after the events shows no dependence on type 2 bursts but the relationship with Ap improves following type 2/4 bursts and a still better improvement is observed with type 2 bursts associated with moving type 4 events. The position of type 2 burst on the solar disk does not seem to affect the Ap values significantly. Similar analysis carried out on the days of occurrence of solar proton events during 1970 to 1979 showed that an enhancement in Ap index on the second/third day is clearly seen in some years but not in all. But on the average, Ap shows significant increase if we consider longer periods, i.e., 5 to 10 year. GRA

N85-19907# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Physics.
EVIDENCE FOR A SOLAR COMPANION STAR
Richard A. Muller Aug. 1984 14 p refs Presented at the 112th Intern. Astronomical Union Symp. on the Search for Extraterrestrial Life: Recent Developments, Boston, 18-21 Jun. 1984
(Contract DE-AC03-76SF-00098)
(DE85-002069; LBL-18271; CONF-8406203-1) Avail: NTIS HC A02/MF A01

periodicity seen in both the mass extinctions and large impact cratering on Earth can be explained if one postulates that the Sun has a companion star, orbiting in a moderately eccentric orbit with a major axis of 2.8 light-years. No other explanations that have been suggested are compatible with known facts of physics and astronomy. If the companion is a red dwarf star, the most common kind in the galaxy, then no previous astronomical observations would have found it. A search for red objects with large parallax is now underway and has a good chance of identifying the star in the near future. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N85-19908*# Iowa Univ., Iowa City.
ANALYSIS OF JOVIAN LOW FREQUENCY RADIO EMISSIONS Final Report
Donald A. Gurnett [1985] 5 p Prepared for JPL
(Contract JPL-956108)
(NASA-CR-174449; NAS 1.26:174449) Avail: NTIS HC A02/MF A01 CSCL 03B

The density of ions in the Io plasma torus and the scattering of these ions by low frequency electromagnetic emissions detected by Voyager 1 were studied. The ion density profile was investigated using whistler dispersion measurements provided by the Voyager plasma instrument. The scale height and absolute density of H+ ions in the vicinity of the plasma torus were determined by combining the measured plasma densities with the whistler dispersion measurements. A theoretical analysis of the modes of propagation of low frequency electromagnetic emissions in the torus was undertaken. Polarization reversal effects and rough estimates of the ion diffusion coefficient were utilized. Numerical evaluation of the ion diffusion coefficients in the torus were made using the observed Voyager 1 wave intensities. Results show that the observed wave intensities produce significant ion diffusion effects in the ion torus. A.S.B.

N85-19909*# Southwest Research Inst., San Antonio, Tex.
THREE DIMENSIONAL RAY TRACING OF THE JOVIAN MAGNETOSPHERE IN THE LOW FREQUENCY RANGE Final

Report
J. D. Menietti May 1984 93 p refs Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-100; JPL-956026; SwRI Proj. 15-6456)
(NASA-CR-175462; JPL-9950-981; NAS 1.26:175462) Avail: NTIS HC A05/MF A01 CSCL 03B

Ray tracing studies of Jovian low frequency emissions were studied. A comprehensive three-dimensional ray tracing computer code for examination of model Jovian decametric (DAM) emission was developed. The improvements to the computer code are outlined and described. The results of the ray tracings of Jovian emissions will be presented in summary form. B.G.

N85-19910*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A MODELING ANALYSIS PROGRAM FOR THE JPL TABLE MOUNTAIN IO SODIUM CLOUD DATA Interim Report, 1 Sep. - 30 Nov. 1984
William H. Smyth and Bruce A. Goldberg Dec. 1984 20 p refs Prepared in cooperation with Atmospheric and Environmental Research, Inc., Cambridge, Mass.
(Contract NASw-3949)
(NASA-CR-175474; NAS 1.26:175474) Avail: NTIS HC A02/MF A01 CSCL 03B

A detailed review of 110 of the 263 Region B/C images of the 1981 data set is undertaken and a preliminary assessment of 39 images of the 1976-79 data set is presented. The basic spatial characteristics of these images are discussed. Modeling analysis of these images after further data processing will provide useful information about Io and the planetary magnetosphere. Plans for data processing and modeling analysis are outlined. Results of very preliminary modeling activities are presented. Author

N85-19911*# Rockwell International Science Center, Thousand Oaks, Calif.
LUNAR SAMPLE ANALYSIS Annual Report, 1 Jan. - 31 Dec. 1984
R. M. Housley Feb. 1985 4 p
(Contract NAS9-11539)
(NASA-CR-171851; NAS 1.26:171851; SC507.71AR; AR-13) Avail: NTIS HC A02/MF A01 CSCL 03B

Recent results on the antarctic meteorite ALPHA 77003 which contribute to understanding the alteration processes which produced matrix in unequilibrated chondrites are presented. Also included are additional scanning electron microscope results confirming that the matrix in Allende was formed by in situ alteration. Author

N85-19243*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VENUS BALLOON PROJECT
R. A. Preston, J. H. Wilcher, and C. T. Stelzried *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 195-201
(For primary document see N85-19224 10-32)
Avail: NTIS HC A13/MF A01 CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-19912*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR CORONA EXPLORER: A MISSION FOR THE PHYSICAL DIAGNOSIS OF THE SOLAR CORONA
Jul. 1981 82 p Original contains color illustrations
(NASA-TM-87416; NAS 1.15:87416) Avail: NTIS HC A05/MF A01 CSCL 03B

Mission objectives and spacecraft requirements for the Solar Corona Explorer (SCE), a proposed free flying, unmanned solar research craft to be tenatively launched in 1987, were defined. The SCE's purpose is to investigate structure, dynamics and evolution of the corona, globally and in the required physical detail, to study the close coupling between the inner corona and the heliosphere. Investigative objectives are: (1) to understand the corona as the source of varying interplanetary plasma and of varying solar X-ray and extreme ultraviolet fluxes; (2) to develop the capabilities to model the corona with sufficient precision to forecast the Earth's variable environment in space, on the scales from weeks to years; (3) to develop an understanding of the physical processes that determine the dynamics and physical state of the coronal plasma, particularly acceleration processes; and (4) to develop insight and test theory on the Sun applicable to stellar coronae and winds, and in particular, to understand why cool stars put such a large fraction of their energy into X-rays. Considered related factors are: (1) duration of the mission; (2) onboard measuring instrumentation; (3) ground support equipment and procedures; and (4) programs of interpretation and modeling. G.L.C.

N85-19913*# Stanford Univ., Calif. Dept. of Applied Physics.
DIRECTIVITY OF BREMSSTRAHLUNG RADIATION FROM RELATIVISTIC BEAMS AND THE GAMMA-RAYS FROM SOLAR FLARES
Vahe Petrosian Feb. 1985 30 p refs
(Grants NsG-7092; NSF ATM-83-20439)
(NASA-CR-174433; NAS 1.26:174433; CSSA-ASTRO-85-12) Avail: NTIS HC A03/MF A01 CSCL 03B

It has been observed that flares with greater than 10 Mev gamma-ray emission are concentrated around the solar limb with a dispersion of 10 to 20 degrees. It is shown that the bremsstrahlung by relativistic electrons is responsible for such gamma-rays and that the expected relativistic beaming cannot explain this dispersion. It is argued that this dispersion is predominately a reflection of the pitch angle distribution of the electrons. Then it is shown that this requires a small variation of the magnetic field from the point where the electrons are injected to the photosphere and a nearly isotropic (in the downward direction) pitch angle distribution at the injection. The influence of other effects on the observed distribution is also discussed. Author

N85-19914*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
USER'S GUIDE FOR THE NIMBUS 7 ERB SOLAR ANALYSIS TAPE (ESAT)
J. R. Hickey, E. R. Major, and H. L. Kyle Aug. 1984 83 p refs
(Contract NAS5-27728)
(NASA-TM-86143; NAS 1.15:86143) Avail: NTIS HC A05/MF A01 CSCL 03B

Five years of Nimbus 7 ERB solar data is available in compact form on a single ERB solar analysis tape (ESAT). The period covered is November 16, 1978 through October 31, 1983. The Nimbus 7 satellite performs just under 14 orbits a day and the ERB solar telescope observe the Sun once per orbit as the satellite passes + or - near the south pole. The data were carefully calibrated and screened. Mean orbital and daily values are given for the total solar irradiance plus selected spectral intervals. In addition, selected solar activity indicators are on the tape. The ERB experiment, the solar data calibration and screening procedures, the solar activity indicators, and the tape format are described briefly. Author

N85-19915# Stanford Univ., Calif. Center for Space Science and Astrophysics.
PHYSICAL ASPECTS OF THE PREDICTION OF SOLAR FLARES
P. A. Sturrock Nov. 1984 12 p
(Grants NAGw-92; NGL-05-020-272; Contract N00014-75-C-0673)
(NASA-CR-175487; NAS 1.26:175487; AD-A149183; SU-CSSA-ASTRO-84-10) Avail: NTIS HC A02/MF A01 CSCL 03B

The properties of a solar flare depend critically on the preflare magnetic-field configuration and the way that this configuration evolves during the flare process. The flare process often, if not always, involves the eruption of a filament or similar structure,

possibly leading to complete ejection from the Sun. This eruption will generate an extensive current sheet: reconnection of this sheet contributes to the gradual phase and perhaps also to the impulsive phase. It is proposed that reconnection of a current sheet (pre-existing, or generated by filament eruption) is required for a gamma-ray event or a particle event. A particle event requires also an escape mechanism that could be provided either by a pre-existing open current sheet or by the ejection of the magnetic-field configuration associated with a filament. Following these guidelines, it is possible to propose a classification of flares into seven categories and to propose whether or not each category will lead to the following phenomena: mass ejection, shock wave, gamma-ray emission, and particle event. GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-19916*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.

X-RAY BURSTS: OBSERVATION VERSUS THEORY

Walter H. G. Lewin 1981 10 p refs Presented at the Symp. on Neutron Stars, Istanbul, 7-11 Sep. 1981; sponsored by the European Physical Society

(Contract NAS5-24441)

(NASA-CR-174415; NAS 1.26:174415; CSR-HEA-82-3) Avail: NTIS HC A02/MF A01 CSCL 03B

Results of various observations of common type I X-ray bursts are discussed with respect to the theory of thermonuclear flashes in the surface layers of accreting neutron stars. Topics covered include burst profiles; irregular burst intervals; rise and decay times and the role of hydrogen; the accuracy of source distances; accuracy in radii determination; radius increase early in the burst; the super Eddington limit; temperatures at burst maximum; and the role of the magnetic field. A.R.H.

N85-19225*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ARCSECOND POSITIONS FOR MILLIARCSECOND VLBI NUCLEI OF EXTRAGALACTIC RADIO SOURCES. PART 3: 74 SOURCES

D. D. Morabito, R. A. Preston, R. P. Linfield, M. A. Slade, A. E. Wehrle (California Univ., Los Angeles), J. Faulkner (Univ. of Southern California), and D. L. Jauncey (CSIRO) *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1985 p 1-7 refs (For primary document see N85-19224 10-32)

Avail: NTIS HC A13/MF A01 CSCL 03B

99 GENERAL

N85-19917# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

CALENDAR OF SELECTED AERONAUTICAL AND SPACE MEETINGS

Loughton, England Dec. 1984 121 p

(AGARD-Cal-84/2; ISBN-92-835-0370-8) Avail: NTIS HC A06/MF A01

Meetings, exhibitions, and education courses, held all in all parts of the world, in the field of aerospace and aeronautical research and development, as well as in directly related scientific fields, are listed. Each entry shows: the reference number; the data and location; the title and sponsor; keywords indicating main topics; and a control code for making inquiries. A subject index in is included. A.R.H.

N85-19918# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C.

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR) TECHNICAL REPORT SUMMARIES. THIRD QUARTER (CY) Quarterly Report, Jul. - Sep. 1984

B. J. Wert Oct. 1984 162 p

(AD-A148965; AFOSR-84-1104TR) Avail: NTIS HC A08/MF A01 CSCL 05/2

The AFOSR Technical Report Summaries are published quarterly of each calendar year. They consist of a brief summary of each AFOSR technical report received in the Technical Information Division and submitted to the Defense Technical Information Center for that quarter. GRA

N85-19919# Vermont Univ., Burlington.

EUROPEAN SCIENTIFIC NOTES. VOLUME 39, NUMBER 2

L. E. Shaffer, ed. Feb. 1985 45 p

(AD-A148994; AD-E301513; ESN-39-2) Avail: NTIS HC A03/MF A01 CSCL 05/2

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European science and technology and to the institutions and people responsible for these efforts. ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research and Standardization Group. Qualified US scientists travelling in Europe may also be invited to author an ESN article. Author (GRA)

N85-19920# Deputy Chief of Staff for Research Development and Acquisition (Army), Washington, D.C.

PROCEEDINGS OF THE 14TH ARMY SCIENCE CONFERENCE. VOLUME 1: PRINCIPAL AUTHORS A THROUGH H

22 Jun. 1984 372 p Proc. held at West Point, N.Y., 19-21 Jun. 1984

(AD-A149200) Avail: NTIS HC A16/MF A01 CSCL 05/2

These Proceedings of the 1984 Army Science Conference are a compilation of all papers presented at the conference and the supplemental papers that were submitted. Papers included in this volume follow: Development of a Portable Neutron Source for Radographic Evaluation and Aircraft Structural Defects; Eye Protection Against Lasers; Winter Traction Aids for Wheeled Vehicles; Thrust Dynamics and Helicopter Handling Qualities; Model Helicopter Rotor High-Speed Impulsive Noise; Evaluation of Potential Multipurpose Propellant Additives: Flash-Erosion Suppressant; Laser Projected Live Fire Target System; Deuterium Kinetic Isotope Effect; An experimental Probe for the Molecular Processes Governing the Initiation of TNT and RDX; Field Applicable Micro enzyme-linked Immunosorbent Assay for Detecting Malaria Infected Mosquitoes; A Primitive Driven, Artificial Intelligence Threat Model; Composite Materials for Electrocatalysts; Energy-less Manufacturing of Advanced Ceramics by SHS; Requirements and Specifications for Cartographic Video Discs; A Combined Mangetic and DTA Method for the Determination of Heat Treatment Data for Armament Steels; Symbolic Filtering of Military Messages Using Artificial Intelligence Techniques; Medical Defense Against the Potential Biological Warfare Agent Saxitoxin; Mine Detection in Cold Regions Using Non-Sinusoidal Radar; Field Production of Water for Injection; Light Emission Immunoassay. GRA

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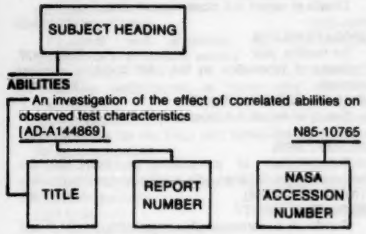

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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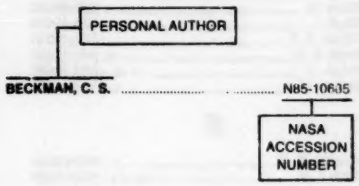

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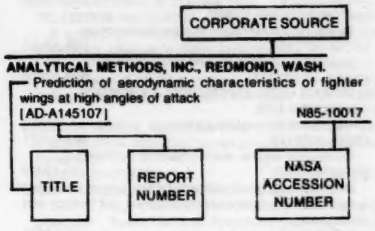

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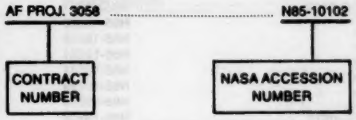

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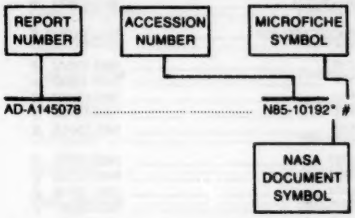

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